

BROOKLYN BOTANIC GARDEN

PLANTS
&
GARDENS



PLANTS & GARDENS

BROOKLYN BOTANIC GARDEN RECORD

LOW-MAINTENANCE GARDENING

A HANDBOOK

1910 CREATING A LOW-MAINTENANCE GARDEN BY
PLANNING AHEAD, DOING IT RIGHT
OCT 20 1984
BUILDING IT RIGHT

Vegetables, Trees, Shrubs, Annuals, Perennials
Prairie Gardens, Raised Beds, Flue-Tile Gardens
Integrated Pest Management (IPM), Mulches



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PLANTS & GARDENS

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LOW-MAINTENANCE GARDENING

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CONTENTS

<i>Gateway to a Meadow</i>	<i>Barbara Emerson</i>	Front Cover
Among Our Contributors		Inside Front Cover
Other Contributors		2
Letter from The Brooklyn Botanic Garden		3
Making the Most of Minimal Maintenance	<i>Alan D. Cook</i>	4
Design for Easy Maintenance	<i>Jack Siebenthaler</i>	6
Planning Ahead with Undeveloped Land	Compiled by <i>Alan Cook</i>	9
Construction Materials and Techniques	<i>Larry Burchfield and Dean Ramsey</i>	11
Irrigation and Drainage	<i>Robert E. Partyka</i>	16
More Irrigation Notes		18
Dealing with Banks	<i>Gilbert L. Whitsel</i>	19
Fuss-Free Vegetables	<i>Richard DeLano</i>	23
More Fuss-Freeing in the Vegetable Patch		26
Minimal Maintenance Trees and Shrubs	<i>Michael A. Dirr</i>	27
Random Thoughts for Good Results		30
Herbaceous Perennials Reduce Landscape Maintenance	<i>J. Paul Bowles</i>	31
Practical Rock Gardening	<i>Marnie Flook</i>	35
Eleven Easy Annuals	<i>Donna Hunter</i>	38
Alternatives to Conventional Gardens	<i>Kris S. Jarantoski</i>	42
Flue-Tile Gardening	<i>Patricia Talbert</i>	46
Low Maintenance Lawns	<i>Robert W. Schery</i>	48
A Minimal Maintenance Alternative	<i>Betty Frankel</i>	51
Ground Covers	<i>Gayle Weinstein</i>	52
Prairie Communities in Landscapes	<i>Charles T. Gleaves</i>	56
Wildflowers and Naturalized Exotics as Lawn Substitutes	<i>Virginia L. Beatty</i>	59
Local Native Plant Sources, Free		61
Mulches Nature's Easy Way to Grow Plants	<i>Doc and Katy Abraham</i>	62
More on Mulches	<i>Alan D. Cook</i>	66
Weeds	<i>Alan D. Cook</i>	67
Tools to Save Time and Effort	<i>Edwin F. Steffek</i>	69
Tool Tips		69
Integrated Pest Management (IPM)	<i>David G. Nielsen</i>	70
Pesticide Pointers		72
Arnold Arboretum Zone Map		72

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LETTER FROM THE
BROOKLYN BOTANIC GARDEN

Dear Friend of Brooklyn Botanic Garden,

Your publication, PLANTS & GARDENS, is now in its 39th year. It was the brain-child of Dr. George S. Avery (BBG Director from 1944 through 1969) and was steered by him, with the help of many horticultural "greats," notably Montague Free and John Wister, until his retirement. At that time the editorial responsibility went to Frederick McGourty.

During his fourteen years of editorship Mr. McGourty delighted BBG readers with his choice of subjects and selection of guest editors for practical gardening counsel, occasionally straying into more craft-related topics. His sprightly style and keen sense of humor were especially appreciated.

Now Frederick McGourty has left BBG to pursue interests in his own nursery-garden, also in writing, consulting and speaking on horticultural subjects. We wish him all success and look forward to products of his pen.

The Botanic Garden has been fortunate in engaging the services of Alan D. Cook, Senior Horticulturist of the Dawes Arboretum, Newark, Ohio, as Interim Editor. Mr. Cook is no stranger to P&G readers, having been represented in several issues as well as Guest Editing the Handbook on Pruning (Vol. 37, No. 2).

It is seven years since Paul Frese, a long-time BBG friend, was guest editor of Gardening Guide for Homeowners. Now Alan Cook and his stellar cast of contributors take the basic subject a step further and share their knowledge of time-and-labor-saving practices in the garden with 11,000 BBG members (in every state of the U.S. and fifty other countries) as well as readers everywhere.

Good trouble-free gardening to all.

Sincerely,

Elizabeth Schultz.

MAKING THE MOST OF MINIMAL MAINTENANCE

Alan D. Cook

If you have the energy of a four-year-old on Sunday morning, the money of a rock star and the spare time of a photographer of eclipses visible in Boise, Idaho, probably you don't need this Handbook.

If you are consummately lazy, fiendishly clever and easily pleased, probably you don't need this Handbook—likely you *invented* minimal maintenance.

But if you have meals and muscle tone to produce, cars and cats to get fixed, checking accounts and family spats to reconcile, probably you can use this Handbook.

But a handbook this size can't say it all. Even if it could, the advice might not always work in your (pick one or more) clay, sand, stones, wind, cold, heat, rain, drought, other adversity. And remember "TINSTAAFL," the acronym for "There's no such thing as a free lunch." Even if you blacktop the entire lot, there'll be upkeep. There'll be cracks to patch and sealant to apply, and when the moon is right, milkshake cups and beer cans sprout overnight.

The aim of this Handbook is to help you observe, ask, read, think and work out an acceptable effort-benefit ratio for your unique situation. Try to work with what you have rather than fight it. Cover an old stump with vines; grow arid-tolerant wildflowers in that gravelly spot that rejects grass.

One key to minimal maintenance is the tradeoff. Perhaps you may decide the attention demands of hybrid tea roses are more than your schedule (and petty cash fund) can afford. An acceptable tradeoff could be a few species roses (e.g., Father Hugo rose and rugosa rose) that are content with an occasional smile of approval. A patch of pretty creeping phlox sometimes will meekly allow grass to invade its space. Carpet bugle (*Ajuga* spp.), perhaps not as attractive, may do the job, but then in the heat of triumph charge off to invade the lawn. Tradeoffs will always be with us.

Finding the Right Plant

Another way to lower maintenance (assuming an acceptable tradeoff) is finding the right plant for a given site. Lists of low maintenance plants are helpful, but not gospel. To find the species and varieties best for your area, look around. If all the big beautiful rhododendrons in cemeteries and old estates are *Rhododendron catawbiense* 'Roseum Elegans', then maybe that's the one for you. If you don't see any rhododendrons anywhere in your area, probably there are reasons why you should purchase something else.

Soil and climate differences between sites only a few miles apart can be critical. A tree growing in well-drained soil can often survive temperatures as much as ten degrees colder than can the same species in heavy poorly-drained soil. Planting with the crown an inch or two above ground level is advisable in heavy soil.

Insect and disease problems vary with soil and climate combinations. For example, cranberry cotoneaster (*C. apiculatus*) is subject to fireblight disease in Boston, but not so in Cleveland. Crimean linden (*Tilia euchlora*) is a handsome tree, except in areas populated by Japanese beetles.

A tree might be ideal in a border planting but a nuisance elsewhere on the property. Magnolia petals, sweetgum fruits and other discarded parts are less than desirable on a patio, for instance. Dr. O.D. Diller of Wooster, Ohio, reports that one of the largest American holly trees in Ohio was in jeopardy because the owner found the spines on the fallen leaves painful to her bare feet.

Using Native Plants

Some natives are reliable and exquisite, like the girl next door who's the equal of the model in the shampoo ad. Native mood lifters include flowering dogwood (*Cornus florida*) and sweetbay magnolia (*M. virgin-*



Chains and Jeeps? Dynamite? In this case the old hackneyed phrase "Turn it into a planter" seems a much pleasanter solution.

iana), goldenrod (*Solidago* spp.) and wood lily (*Lilium philadelphicum*).

But what of the neighborhood bums, hanging around all the time needing a shave and flouting anti-litter laws? Black locust (*Robinia pseudoacacia*) and the beautiful-in-the-neighbor's-yard sycamore (*Platanus occidentalis*) are uncouth natives. Black locust has untidy raiment due to leaf miners, the heartbreak of locust borer and a nasty habit of discarding used branches in the yard. Sycamore is unable to kick the anthracnose habit when springtimes are wet, and has a year-round schedule for dropping debris (round fruits that turn into fuzz, gross leaves, hunks of bark that were lovely on the tree but yucky on the sod, and limbs of wood that won't burn well in the fireplace). Fortunately there are better choices. If you've inherited a bum tree, replace it with one with better manners.

Some native plants that are indigenous over vast geographic areas have developed strains or subspecies that are suited only to specific portions of the total range of the species. *Acer rubrum*, called red maple or swamp maple, is such a plant. It's found growing wild from southern Canada to mid-Florida,

but plants from Canada can't grow in Florida because they're geared to a winter rest period. And the Florida strain can't stand freezing temperatures. In these cases, it's best to buy locally grown plants or plants from nurseries that propagate stock in the same zone as your garden, such as a mid-New York State homeowner ordering from a north Ohio nursery.

But "Use natives," as a mandate, is akin to ethnic discrimination. Also get acquainted with plants from other places; you'll enjoy them. Try pachysandra from Japan, *Vinca minor* from Europe, ginkgo from China, *Clematis paniculata* from New Zealand. They'll punch the time clock every day and pay taxes.

Assess what you have and what you're willing to do to plan and execute a garden that will be low maintenance in the long run. Ask local authorities—county extension people, arboretum and botanic garden personnel, horticulture professors and teachers, garden editors, experienced local nurserymen. Ask several and average the replies—they'll not agree completely but they'll give you good basic advice you can adapt to your own taste and requirements. 

DESIGN FOR EASY MAINTENANCE

Jack Siebenthaler

The "Three Musketeers" of successful landscape development are Good Design, Proper Installation and Continuing Effective Maintenance. Of the three factors, maintenance is the most time consuming and it's not always easy but the results are worth it.

Residential property owners often spend more money than necessary for upkeep of the landscape. Usually the main reason for this expenditure is improper design resulting in many barriers to successful maintenance. Drainage, elevation changes, permanent architectural features such as walls, walks, pools and other key "Phase One" ingredients are relatively permanent. The misuse of such ingredients in the landscape can be a source of acute and permanent problems.

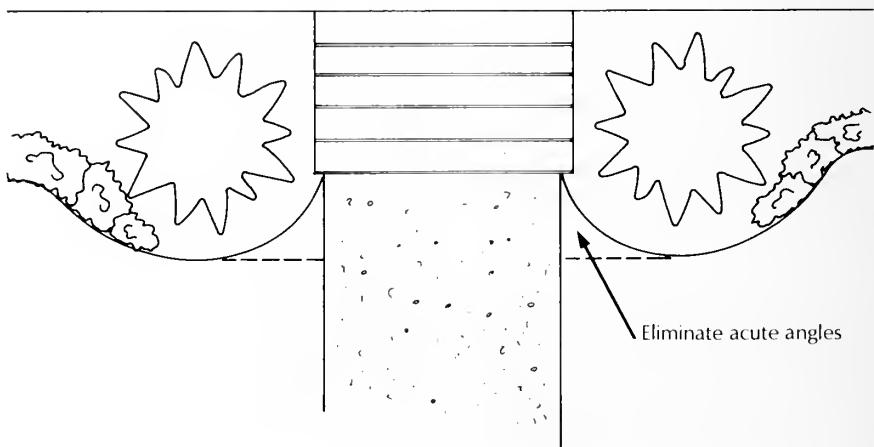
The proper installation of a low retaining wall of well-preserved railroad ties or other timbers can be an attractive and functional feature that also will prevent erosion and maintenance problems in the garden. A gentle swale, designed for rapid runoff of heavy rain, yet allowing easy grass care, can often be the

answer to an otherwise grievous problem.

Maintenance requirements need to be considered in all areas of the landscape picture—background plantings, screens, color features, specimens—all important to the whole presentation. There are many choices for each item in the landscape. To effectively combine good design with minimal maintenance, the best choices must be made at the earliest stage of the planning. Rate of growth is of critical concern. When two or more plants can serve the same purpose (such as screening), then consideration should be given to the selection which requires the least maintenance and pest control.

Unlike fences, walls, sculptures and the like, living plants are changeable. This becomes a very important factor in maintenance. The decision whether or not to allow a substantial change in form or size must be made. If the plant is to remain a certain size, then one should choose a relatively slow-growing species or variety.

Hardiness and environmental adaptability



Drawings by Kay King after Peggy MacNeale



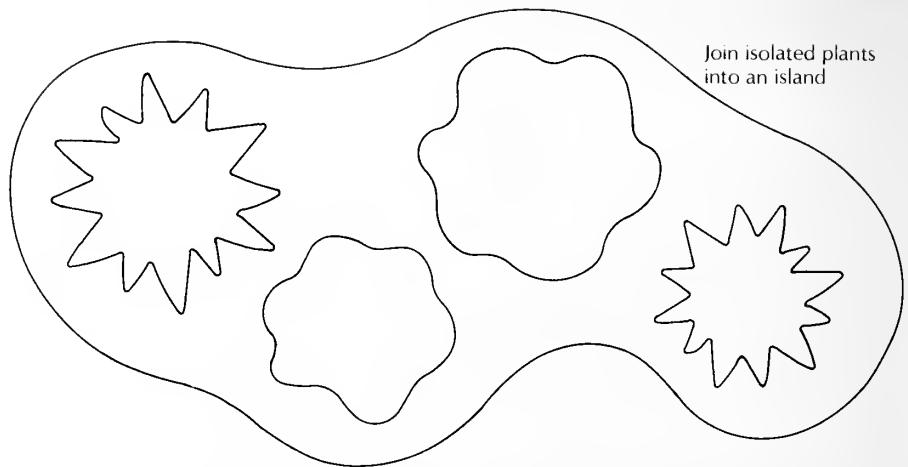
Groundcovers and dwarf shrubs virtually eliminate maintenance on this potentially difficult slope.

are too often overlooked when choosing plants. Not only the ability to withstand temperature extremes, but the success when grown in sun or shade, dry or wet conditions or windy versus protected locales should be considered. Why should we become dependent on an important element of the landscape only to have it eliminated during the first severe freeze or wet weather spell?

The initial design stage is the point when important decisions must be made insofar as long-term maintenance is concerned. The form which the garden will take—curvilinear or angular—can make a difference in mainte-

nance costs in both time and money. Such built-in features as generous ground cover areas, mowing strips, large mulched areas and proper sun and shade relationships go far to govern the maintenance program of the landscape. An often-overlooked matter is the changing relationship of sun to shade, caused by the growth of larger trees and shrubs. This change can result in a phasing-out of plants not tolerant of heavy shade unless plans were properly made initially.

Whether to mulch garden areas or not, and which mulching material to use, can and should be decided before, not after, plant-



Incorporating trees and shrubs into a mulched island eases mowing and weeding chores.

ing. The choice of inorganic (rock) or organic mulches is important for several reasons. The "hard" mulches, such as "egg rock" or "lava rock" types are permanent and need little or no replacement, but they do not offer the soil any of the building materials that the many organic mulches provide. In addition, the natural coloring of pine needles, bark mulches and other "earth tone" materials offers low maintenance by not requiring the removal of fallen leaves, small twigs and other naturally accumulated debris.

In the application of mulches, the initial placement at the proper level is very important. The top of the *mulch* layer should be even with pavement grades or the lawn level adjacent to the landscaped bed in order to prevent erosion of the mulch. A common mistake is to bring the soil bed up to the existing grade, thus making the mulched layer higher than surrounding levels.

When designing grassed areas, a common trouble spot is the narrow strip which often occurs between planting beds and drives, walks and parking areas. It is often better to plant the beds so that grass will not be needed. A low ground cover is generally very satisfactory and will soften the paving line.

As a general rule, large areas are easier to maintain than a series of smaller areas. Maintenance, be it fertilizing, mowing, pruning,

pest control or replanting, is easier in one larger area than in several smaller ones.

The designing of any landscape project must carry with it the knowledge of each plant type used, along with the requirements for adequate maintenance. When the designer does not have such knowledge the total package will suffer, usually with increasing degrees of failure as the project ages.

Remembering the three interwoven keys to successful landscape development—Good Design, Proper Installation and Continuing Effective Maintenance—and implementing each of these in the proper sequence will assure long-lasting satisfaction in the residential garden.

Recommended Reading

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PLANNING AHEAD TO SAVE WORK

Compiled by Alan Cook

Get all the planning help you can before you do *anything!* Plantsmen want to cry when they see a new house built in the shade of a lovely oak, beech, sugar maple or other touch-me-not species. The folks probably bought the lot just because of the tree. But they kill it with construction, and in several years will pay a non-deductible bundle to have the big corpse removed. Soil compaction, ditching, paving, grade changes, soil-moisture changes and other necessary evils of construction should be carefully planned to protect existing trees as much as possible. If topsoil must be moved, be sure it is stockpiled and replaced. (Speaking of grade changes, walls and steps are fine for just meandering about the property, but how do you get the lawn mower from level to level? Maybe a ramp?)

Before you plan fencing and hedging to make the backyard safe for sun worship, think whether a service or delivery truck will require access someday. Anticipate other traffic patterns and install walks and such at the outset. Make walks at least 42" wide so people can pass or walk side-by-side. Avoid sharp corners; use flowing curves.

Plan to wait a year before installing a concrete or blacktop driveway so soil will settle before, not after, paving.

Before planting, make sure soil is tamped firmly around foundations and into utility trenches and other excavations. It's not fun to dig up plants or sod because they've sunk a foot.

Planning for Planting

For color, use lots of flowering shrubs so you can go easy with annuals and perennials which have higher maintenance requirements. In planning gardens and plantings, remember that formality demands near-perfection to look presentable, while informal

areas can soak up a little neglect and still look cozy. Avoid hedges that need shearing. Plant mixed shrub borders instead. Keep flower and vegetable garden beds no wider than five feet to allow reasonable ease of weed control, pinching, and other chores. Figure walks at least 20" for stand-up maintenance, 30" for kneeling. If you have large feet or long legs, allow more. Consider grassed walks between vegetable and flower beds. They have to be mowed, but don't add much time to your total lawnmowing chore. And slugs find no refuge in grass.

Set priorities. If you really want a dandy daylily collection, then don't grow so many zucchini squash that you can supply the entire neighborhood as well as the office. If you can't live without espaliered nectarines, maybe only three varieties of zinnias can suffice.

If your house has no foundation, why plan a foundation planting of shrubs that require annual or oftener pruning? If you must have such a planting, keep it far enough away from the house to allow room for window-washing, painting and other maintenance.

20/20 Foresight

Garbage cans should be near the kitchen door for easy disposal, close to the driveway for easy pick up, and hidden from the street so you can stay in the neighborhood beautification association. Plan a covered area for firewood near a door that's near the fireplace, and somewhere easy for the delivery people. Unlike refuse cans, wood need not be hidden away. Flaunt it if you like. Sand boxes and swings should be conveniently viewable from the house. Sand should be remote enough to minimize accumulation on the kitchen floor (the farther the kids travel for cookies and milk, the more sand falls off).

Tool storage is often unplanned, so think

ahead to save time and trouble. For example, plan a place for the snowblower that doesn't require the snowblower to get to. You can always just leave the garden hose sprawled across the patio, if your insurance is paid up. Why not have it on a spool near a tap? Put tidy little boxes (mail boxes are fine) on posts in or near the vegetable garden and other frequently worked areas. In the boxes put twistems, pruners, labels, trowel and other little tools that you always leave in the garage and have to go back to get.

Lots of open area? More than you need for frisbees and chip shot practice? Invest in fencing and raise a few sheep or some goats, or at least pasture a pony for the kids. Zoning laws prohibit animals? Then establish prairie grasses and wildflowers. Or get inexpensive tree seedlings from your state government or a mail-order nursery and start a woodlot.

How about a gazebo or grape arbor with a little potting bench? On hot days, chores like shelling beans or dividing iris would be more fun in such a shady nook.

Taking photographs (every other year or so) of your landscaping may not exactly save maintenance, but it can save headaches if

lightning, forest fire, a wayward delivery truck or other disaster takes out your vine-covered boxelder tree. Photos will help in establishing values for insurance claims and income tax deductions.

Use silicone spray (available in aerosol cans) on snow shovels.

Install water faucets and electrical outlets in strategic places.

Thoughtful planning is the way to easy upkeep.

Additional Reading

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Roche



Casual groupings of low-care perennials reduces work. The only drawback here is the excessive depth of the bed. Feverfew, phlox and alyssum, among others, are the stars in August.

CONSTRUCTION MATERIALS AND TECHNIQUES

Information from Larry Burchfield and Dean Ramsey

Whether you build walls, walks and patios yourself or engage a contractor, the materials and methods should be of top quality for appearance, ease of maintenance and longevity.

Mowing the lawn is a pesky chore, but clearing away a collapsed wall and building another is a calamity. Weeding the pelargoniums takes a few moments; replacing a rotted deck takes hours, days.

Some Concrete Tips

Concrete ("cement" is a component of concrete) is a commonly used material for steps, walks, patios and retaining walls. Concrete for exposed exterior use should contain 5½ to 6 bags of cement per cubic yard, and only clean hard aggregate, no soft, porous or dirty gravel or sand. The mixture should contain about 6 percent air and only enough water to make it workable. Soupy concrete results in separation of contents and structural weakness.

Order or mix more than you'll need so you won't have to add a layer or a section later and lose unity. Before pouring moisten the surface of the area to be filled. If reinforcing rods or wire fabric are used, be sure the steel is not close to the surface. If it is, the surface can pop off and expose the reinforcing elements, which will rust.

Don't overwork concrete. Excessive troweling can change the composition at the surface.

Do not do concrete work on hot, dry days. Concrete may set too quickly. In this case the temptation is to add water to the surface in order to complete the working of it. The usual result is the flaking-off of surface pieces, especially during freeze-thaw weather cycles. Speaking of freezing—don't install concrete when freezing is expected within ten days to two weeks.

Expansion joints and scoring to control cracking are important. Scoring is often done about ½ inch deep with a special saw about

thirty-six hours after installation, or at time of pouring with a grooving tool. A curing compound or sealant should be applied to the surface as soon as final finish work is done.

A brushed or other roughened surface makes sense for walks and patio slabs because smooth concrete is slippery when wet. Exposed aggregate finishes offer a variety of beautiful effects, but only an experienced concrete operator should attempt them.

Bricks for Walks and Patios

Bricks are often used for walks and patios and there are several types. Common facing-brick is three inches thick. A popular patio brick is only one-and-one-half-inches thick. The heavier, stronger brick for this purpose is concrete brick.

If bricks are to be mortared, a concrete slab must be properly installed first and bricks installed later. "Dry laid" brick work is cheaper and has the advantage of relatively simple repair if settling occurs later. (If concrete settles, it breaks, and decent repair is not possible.) To lay bricks in this manner, dig at least six inches deep to undisturbed, solid soil (Fig. 1). Apply four to five inches of limestone dust, doing so in two equal applications. Wet the first layer of limestone dust to saturation and tamp it vigorously. Then apply the rest of the limestone dust and repeat the watering and tamping. A vibrating tamper (rentable) is best.

There must be an edging to keep the flat surface bricks in place. A simple method is to dig a trench, put bricks on end and tamp them in to form an edge. (In cold climates and areas of heavy traffic, such an edging will gradually move and will need periodic repair.) Old railroad ties can be used, but manufactured 6" × 6" or 6" × 8" timbers, pressure-treated with nontoxic preservative ("Wolmanizing" is a brand name for such a

treatment) are uniform and easier to use. After a season in place, treated lumber can be stained with various pigments.

A patio of any appreciable size should have a gentle slope for surface drainage of one inch in ten feet. The edging should establish this. The edging should be at the desired grade with the tamped limestone dust low enough to accommodate the bricks to be used and using no more than one-half-inch of masonry sand. If edging can be installed precisely enough, bricks may be laid without need of cutting.

A weed barrier atop the tamped limestone dust can be plastic or tar paper or one of the newer fabrics that, unlike the plastic and paper, allows water to seep through.

Spread fine sand, just enough for leveling purposes ($\frac{1}{4}$ to $\frac{1}{2}$ inch), on the barrier material and lay bricks in any desired pattern, as level as possible and touching one another. If the outside rows of bricks don't fit exactly inside the edging, they must be cut with a special power saw that can be rented from many equipment rental establishments.

After bricks are all in place, scatter masonry sand on them and sweep or brush it firmly into cracks. If the surface doesn't come out quite level, put an old carpet or heavy burlap on the bricks and tamp again.

Using Stones for Patios and Retaining Walls

A flagstone patio can be dry-laid in similar fashion to the brick patio. Flagstones should be at least two inches thick; thin stones seldom last. "Wet-laid" flagstones (on a "float-

ing" reinforced concrete slab and mortared thereupon) make a good patio, but this is a project for experienced professionals only.

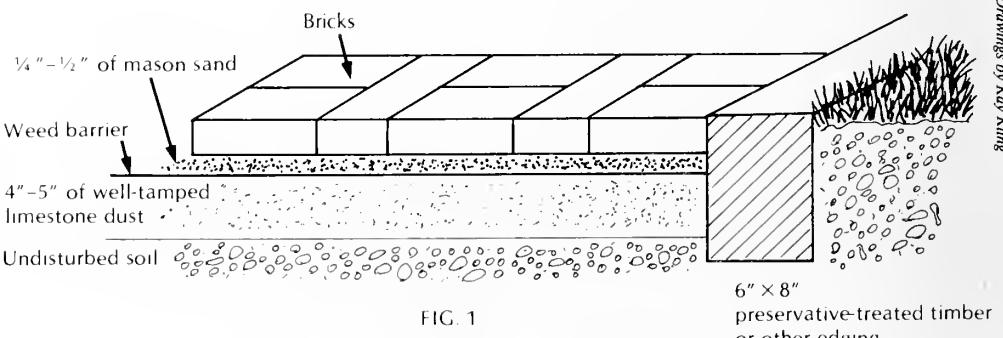
In mild climates, dry-laid flagstones can have a mixture of sand and cement brushed between the stones, wetted down, and allowed to dry. This treatment will not stand freezing and thawing.

For grade-changing walls, flat stones at least 3" thick and 12" wide and preferably more, up to sizes beyond the capability of the builder(s), can be used. Any slope of 30° or steeper (about 2 to 1, meaning the grade changes by one vertical foot in the space of two feet horizontally) is a candidate for a wall.

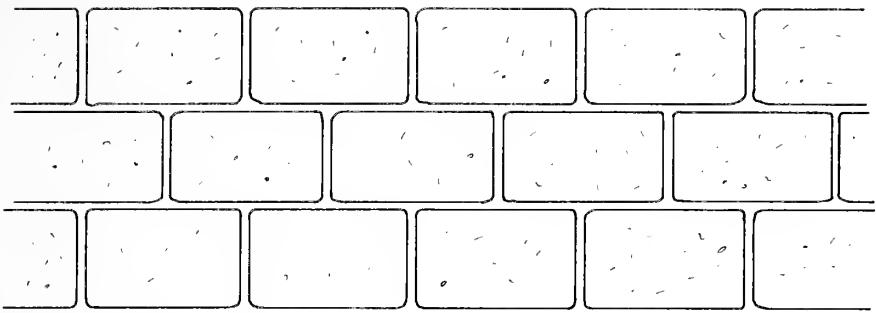
For a dry-laid stone wall, dig out six inches or more along the base of the bank and lay the first row of stones as level as possible along the bank, but slanting slightly backward into the bank. Use the largest stones for the bottom tier, saving the smallest for the top. The wall must be at least twelve inches thick, preferably wider at the base.

Lay the second tier of stones to bridge joints in the first, and set it back a couple of inches (Fig. 2). The finished wall should slope into the bank as much as possible, at least two or three inches per vertical foot. The higher the wall, the more pitch is recommended. Tamp soil firmly behind the stones of each tier as construction progresses.

If conditions are wet or if freezing will occur in winter, drainage should be provided behind the first row of stones. Flexible plastic tile is available for the purpose. The trick is to install it so that water is carried away and disposed of in an acceptable manner.

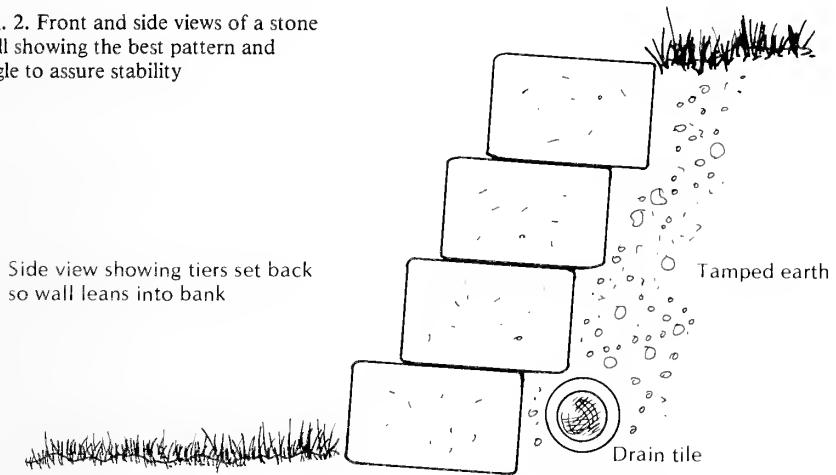


Laying a brick patio or walk



Stones staggered to bridge joints

Fig. 2. Front and side views of a stone wall showing the best pattern and angle to assure stability



As a general rule, a dry-laid retaining stone wall, especially in cold climates, should not be higher than four feet. A masonry wall, with stones mortared together, requires a footing of poured concrete that extends below the freezing level for the region. In colder states this can be three feet or even more. Masonry walls require weep holes for escape of free water.

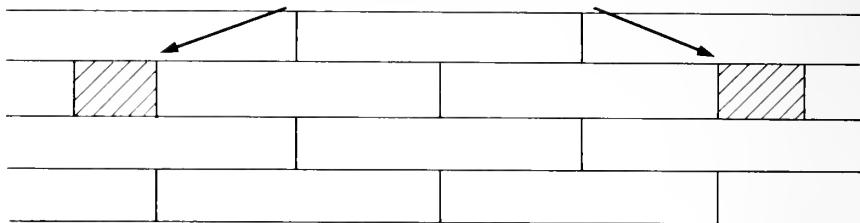
Ties and Timbers

Used railroad ties, once the staple grade-change material for terrace and retaining walls and associated steps, are giving way to the aforementioned pressure-treated timbers because ties are not uniform, they often contain pieces of metal that can ruin a saw blade, and are often badly rotted inside and thus will not last long. In hot weather they may "bleed" creosote, toxic to plants and irritating to skin and nasty stuff to track indoors.

For a time, used railroad ties were inexpensive. But today the far-superior treated timbers, which come in various handy uniform sizes and are good for at least fifteen years in contact with soil in most parts of the country, cost only 20 to 25 percent more than reclaimed ties.

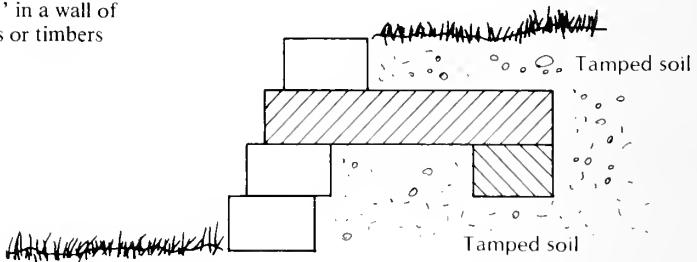
Ties and timbers used as walls must always be level—a slanted or irregular grade is not to be followed. Each tier of ties should be set back two inches and staggered to bridge the joints of the row below; tamp soil behind each row as the wall progresses. Every sixteen horizontal feet of every third tier should have a "dead man" (Fig. 3). (A dead man is a 3 or 4 foot piece going horizontally into the bank.) For extra strength, a 2 or 3 foot piece can be attached to it in a "T" fashion. As the wall is laid, nail each timber from the back side to those beneath and beside it with 60-penny common nails. Use a 2-pound hand sledge.

Butt end of the "dead man"



Front view

Using a "dead man" in a wall of pressure-treated logs or timbers



Side view and top view showing "dead man"

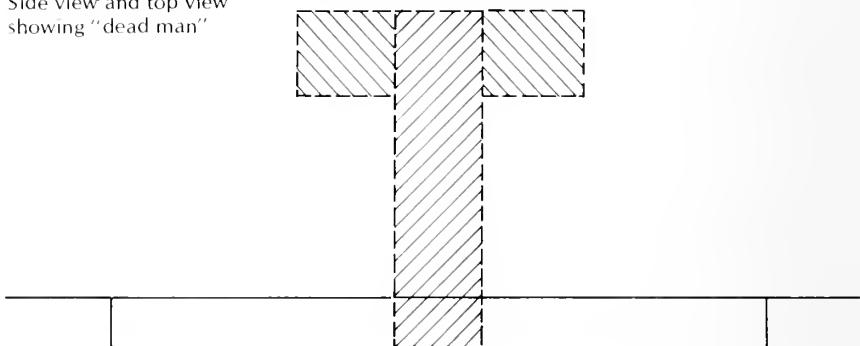


FIG. 3

Another method of securing ties or timbers is to drill vertical holes at least part way and drive $\frac{3}{8}$ " to $\frac{1}{2}$ " diameter cut pieces of reinforcing rods to pin ties together. In freezing weather, ties rodded together sometimes separate, with the ties sliding up the rod. They don't go back. The big nails, of necessity going in at angles, hold better.

Walls with bends, curves or angles are stronger than straight ones, and usually more interesting in the landscape (Fig. 4). Dovetail timbers at the angles.

Lumber for Decks, Walks, Steps

Pressure-treated lumber is available in 4" \times 4", 2" \times 6", and other standard sizes suit-

able for building wooden patios, decks, walks and steps. Cedar lumber, slightly more expensive but very durable, is excellent.

Such construction can be complicated, but a few tips can be offered here. Only galvanized fasteners should be used. Common-headed nails are better than finishing nails (nails without heads). Surface boards should always be put down with bark side up because the other side tends to produce splinters (Fig. 5). Always wait a year before staining or painting treated lumber.

Steps are especially tricky. A few safety rules may have no bearing on low maintenance but are important. Steps should be in groups of three or more; one or even two are

Wall A

Birds-eye view. Wall B is stronger.

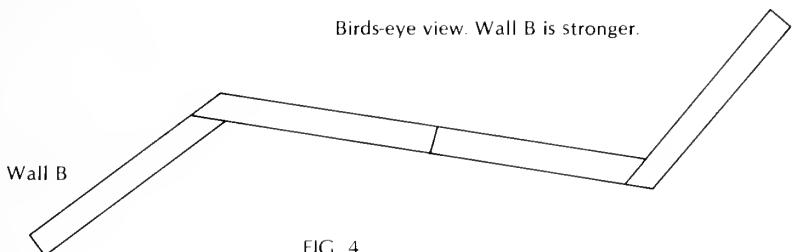


FIG. 4

Angles in a timber wall also increase stability

not always noticed. A nose (overhang) on steps creates a shadow line that aids the eye. Step risers should not be less than 4 or more than 6½ inches. The combination of twice the riser measurement plus that of the tread should equal 27 or 28 inches.

In the long run good materials and good methods can save money and maintenance. Construction, good or bad, is not easy. Ties, timbers and stones are heavy, dangerous to fingers, toes and sacros. Chain saws and other power tools in careless, inexperienced, fatigued hands can lead to trouble. Know your limitations. If you need professional help or equipment for a project, either get it or revise your plans.

Suggested Reading

Downing, M.F. *Landscape Construction*. E. & F.N. Spon, London. Distributed in the

U.S. by the Halsted Press, New York, N.Y. 10158.

Fields, Curtis P. *The Forgotten Art of Building a Stone Wall*. Yankee Press, Dublin, N.H. Available from Walter F. Nicke, Hudson, N.Y. 12534.

Garden Structures, Plants & Gardens Handbook #45. Brooklyn Botanic Garden, 1000 Washington Ave., Brooklyn, N.Y. 11225.

How to Build Decks and How to Build Fences & Gates. Lane Books, Menlo Park, Calif.

Outdoor Landscaping with Concrete. Portland Cement Association, Old Orchard Rd., Skokie, Ill. 60076.

Schuyler, Stanley. *How to Build Fences, Gates & Walls*. Macmillan Publishing Co., Inc., New York.

Tanner, Ogden. *Garden Construction*. Time-Life Books, Alexandria, Va. 

Cedar lumber, bark side up,
for decking

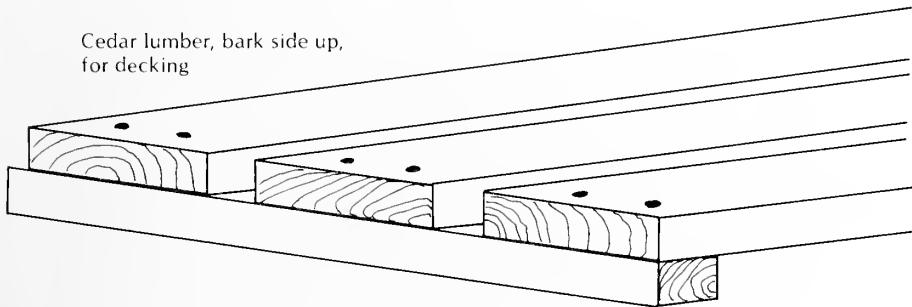


FIG. 5

Use planks bark side up with common-headed nails for decks and steps

IRRIGATION AND DRAINAGE

Robert E. Partyka

The idea of irrigation systems to reduce maintenance time in the lawn and garden area has become more alluring as discretionary income rises and the homeowner finds time for other interests. However, there are factors that must be taken into consideration when planning for or installing irrigation.

The grade or slope of the property needs to be considered. Raised areas will result in water running off more rapidly and accumulating at lower sites, so an irrigation system needs to be designed to consider the run-off and percolation rate of the soil. If the water is applied at a rate faster than it can be absorbed by the soil due to texture and grade, then large quantities of water either may be lost due to run-off or will accumulate and stagnate in low areas, damaging turf or other plants. The irrigation system, therefore, must be designed to provide sufficient but not excessive water. This can be done with nozzles properly sized for the area or, possibly, with a timed system that runs to the point of run-off, and then stops long enough to allow the water to percolate or infiltrate before recycling. This continues until the needed water is applied to the area.

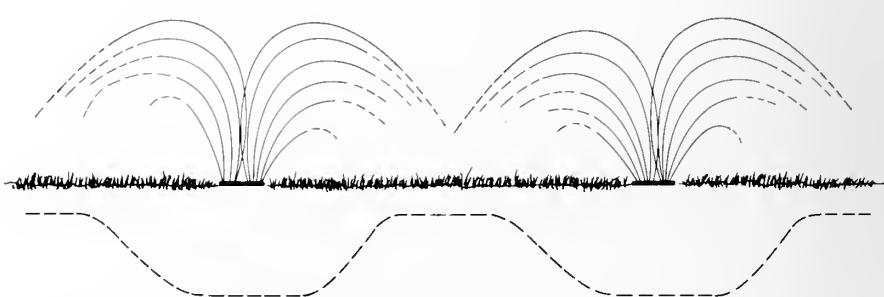
Irrigation heads must be spaced for proper distribution of the desired amount of water. Spacing too wide can result in sections that will appear to be wet but have not

received ample water for percolation to the proper depth (Figs. 1 and 2).

Wind patterns are influenced by buildings and vegetation and should be considered when planning the placement of irrigation units. Some flexibility should be built in to compensate for wind.

In areas of the country where most moisture is supplied by irrigation water, an automatic time clock system based on evaporation rates often performs well. Where natural rainfall is common and irrigation is used to supplement this water, systems need to be designed to allow manual adjustments based on visual appearance of plants and the soil. Soil-moisture sensing devices may be used in combination with evaporation units to provide proper watering frequencies for optimum growth and minimal plant problems.

If the entire property is to be irrigated, one often needs to consider two systems, one for the turf area and another for trees and shrubs because of the differing root depths. Shallow-rooted grass has a limited root system and requires more frequent watering than plants with deeper and more extensive root systems. A single system to water an entire area may result in the proper amount of water for shallow-rooted plants but excess water to those deeper-rooted (Fig. 3). One



Drawings by Kay Kling

Fig. 1. A schematic representation of soil water-depth variations when sprinklers are too far apart and water doesn't overlap.



Fig. 2. Turf areas not receiving necessary amounts of water result in brown or dry sections.

solution may be nozzles of differing capacities to adjust water delivery. Another possibility is selection of plants that will tolerate the unusually wet areas that can result from a single irrigation system.

Soil drainage was mentioned and needs to be considered in most landscapes. A particular soil will only hold a certain amount of water based on particle size and the pull of gravity. In general, a sandy soil is considered a well-drained soil and cannot hold large

quantities of water, but roots develop extensively due to good oxygen or air movement. These soils often need to be watered more frequently because of the rapid water loss. Clay soils, on the other hand, are made up of very fine particles. They are very slow to wet, but are also slow to dry and tend to hold large quantities of water with little oxygen. Root systems of plants often develop where the oxygen level is most favorable. So, if deep roots develop in a favorable soil and



Fig. 3. Small yews in decline because they receive too much water when the lawn gets just enough.

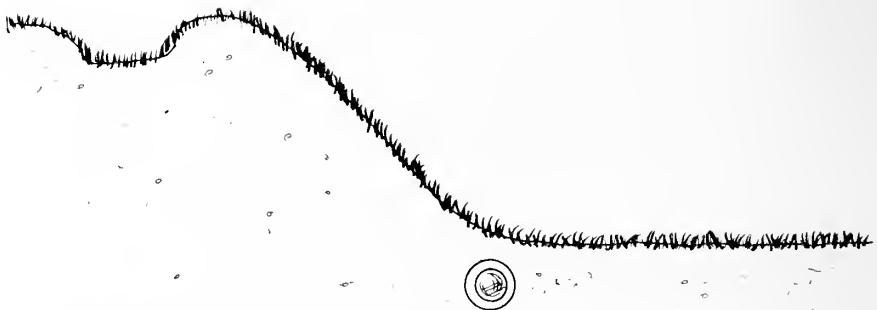


Fig. 4. At the top of the slope a swale (shallow ditch) diverts water from the edge. At the base an underground drain keeps excess water from accumulating.

then the soil is kept overly wet from irrigation or rain, root damage can take place. The length of time the soil remains saturated will determine the extent of root injury.

What To Do

When soil drainage is unfavorable, raised beds can provide a root environment where excess water can drain out. It also may be possible to install drain tile to carry away excess water from the soil pocket (Fig. 4). This type of system is often best installed before planting, but may be put in later where specific drainage problems have developed. (Professional advice is advisable before installation of drain tile.)

Another aspect of irrigation systems that needs to be considered is the effect of mulches. Mulches are often used to reduce weeds in the plant bed, to conserve moisture and to improve appearance. A mulch deep enough to give adequate weed control may create moisture problems under irrigation that could favor root-rot disease organisms. Black plastic used as a mulch often traps ex-

cessive irrigation (or rain) water. Therefore, the type and depth of mulch and the types of plants grown in the area need to be considered. Summer annuals especially are often susceptible to root rot in such situations.

In summary, when considering an irrigation system for the home landscape, it would be advisable to discuss the following topics with the people installing the system and a qualified horticulturist in your area:

1. The possible need for a dual system.
2. Grade or slope of property.
3. Nozzle sizing and time system.
4. Nozzle-spacing design and wind patterns.
5. Manual adjustment capability.
6. Plant species and their tolerances to water and drought.
7. Soil types and their drainage characteristics.
8. Modifications to provide adequate drainage.
9. Mulching materials used around plants.

More Irrigation Notes

Soaker hoses can be laid beneath mulches in beds likely to need watering (rose beds, iris, vegetables). For raised beds, pots and other containers, and vegetable gardens, drip or trickle irrigation is particularly handy. In gently sloping vegetable gardens, trenches 4-5" wide and 3" deep alongside rows of plants can be filled with water as needed. These methods save water in arid regions where water sprinkled through the atmosphere is subject to significant evaporation.

If you do sprinkle, do it in the morning so foliage can dry before nightfall. This tactic can avoid leaf diseases such as mildew.

DEALING WITH BANKS

Gilbert Whitsel

When dealing with your slopes, adopt a positive point of view. After all, from an aesthetic standpoint, changes in grade usually add interest to the scene. If your change in grade is on the street side of the property there are all kinds of possibilities for enhancing the

view of your home. Here you could well afford to use elaborate treatments for the sake of interest.

Also, if a slope rises from where it will be frequently viewed, use it to its utmost to create interest.

George Touloumis



Periwinkle (*Vinca minor*) as a slope cover stabilizes the bank and integrates the house and the lawn.

A change in grade at the side of the house between properties or in the back warrants only the simplest treatment especially if it is seen infrequently.

Diverting water from the steepest surfaces of a bank prevents erosion. Diversion ditching, tiling and other tactics involve engineering expertise and knowledge of local ordinances. Consult local authorities such as Soil Conservation Service personnel or local drainage engineers.

The least expensive treatment of a bank is to grade it and establish a good turf. (See "Low Maintenance Lawns" on page 48.)

This is comparatively easy to establish and maintain if the slope is 3 to 1 or less. This means there are three horizontal feet for each vertical foot. However, slopes that are steeper or which fall a slope distance of 30 feet or more (even though 3 to 1 or less) can be unpleasant to mow. In such a case, you should consider another treatment, such as groundcovers (see "Groundcovers" on page 52) or terracing.

In addition to groundcovers, a variety of shrubs can be planted on banks to help control erosion and add beauty. A mulch of shredded bark or wood chips will aid in es-



Terracing the land is one solution to abrupt or inconvenient changes in slope.



When the slope is acute, the only practical solution may be a retaining wall, but that wall need not be stark or unattractive as this near-hanging garden shows.



On a steep slope that precludes mowing this casual low-maintenance planting includes juniper, bayberry, broom, cotoneaster, beach plum and bush honeysuckle.

Establishing plantings and reducing weed population. If water from elsewhere has been properly diverted, water that falls on the slope itself will not be likely to wash the mulch away.

In shrub planting, without groundcovers as companions, black polyethylene plastic, 4 mil or 6 mil, can be rolled out on the slope and pegged down. Shrubs are planted through "X" cuts rather than holes so the plastic can be replaced around the stem after planting. This eliminates all weeds except the few that find their way through the cuts. Holes poked here and there allow rain water to get to the soil. Wood chips or coarse gravel will hide the plastic and will hold reasonably well on all but the steepest banks. Field stones on angled lines up the slope among the shrubs help control slippage of mulch.

The bank can also be treated with plastic, stones and gravel without any plants. Or flagstones can be laid flat on the plane of the slope (without plastic) with sedum and other small plants put in the cracks between the stones.

Terracing involves considerable initial expense, but it can be an attractive way to treat a bank and afford good erosion control. A small bank could be terraced with just one wall as transition from the lower level to the higher. Larger banks will need several levels. Steps may be built-in for function and increased interest. Terrace walls can be made of flat stones laid dry or mortared, railroad ties, landscape timbers, concrete or other materials. Usually such walls require professional installation. (See "Construction Materials and Techniques" on page 11.)



FUSS-FREE VEGETABLES

Richard DeLano

Fuss-free vegetable gardening or easy-does-it methods seem to proliferate every spring. One of the best shortcuts to an easy, satisfying vegetable garden is choosing the right variety. The right vegetable variety gives the best flavor, takes up the least space and fights off most insects and diseases by itself.

Much of my experience with these notable vegetable varieties is based on our All-America Selections trials at Kishwaukee College at Malta, Illinois. Here horticulture students maintain over a thousand different varieties of flowers and vegetables. In the process they learn to discriminate between the good and the best. This applies not only to flowers and vegetables but fruits, nursery stock, turf plots and shrub beds at one of the leading two-year horticulture schools in the nation.

Let's start with asparagus, the only perennial vegetable I would put in a small garden. Locate the asparagus bed at the back of the garden so you won't have to walk around or over it all summer after you've cut the spring crop. 'Mary Washington' and 'Waltham Washington' have been staple varieties for years, although there is a rumor of some super-succulent varieties that will shortly be released.

Onions and Herbs

Onions from sets are an easy item. 'Ebenezer' and 'Golden Globe' give a good yield in the midwest. Because onions are day-length-sensitive, local seed stores are probably the best sources for information on the best variety for your area.

W. Atlee Burpee Co.



The feathery foliage and anise-tasting leaf bases of Florence fennel increase its attractiveness as an easy to grow vegetable.



Raised beds and plastic mulching further cut down on the work in a vegetable garden.

Chives are another good trouble-free item if you have a use for them. Also tasty are the flower buds but they can make you socially unacceptable for a day or so. After the buds open the flowers make a very attractive purple-flowered edging. Once started, a clump of chives will spread rapidly and live for years, trouble-free.

Yet another novelty for the garden is fennel. It's as easy to grow as dill. Just sow the seed and stand aside. As a matter of fact, it even looks like dill. A gentle practical joke is to invite visitors to your garden to identify this plant. Invariably they'll label it dill. Then cut a section of stem and invite them to chew. Puzzled looks will reflect their surprise at tasting licorice or anise. Fennel can be advantageously included in cream soups.

Peas and Beans

There was a time when peas were only for the sophisticated early-bird gardener. No more. 'Novella', a dwarf variety, requires no staking and certainly saves labor. 'Sugar Snap' will bear almost halfway through the summer, and has another labor-saving feature: it doesn't need shelling. You can eat it pod and all, like a snap bean.

Bush beans require quite low maintenance, but not pole beans, which need poles which must be set and, of course, stored after harvest. Among the green bush beans, 'Tender Crop', 'Spartan', 'Arrow', 'Top Crop', 'Contender' and 'Royalty' have done well in our test plots. 'Royalty' is valuable as a novelty. The beans are purple, but during cooking they turn a normal green. Wax or

yellow bean varieties of choice are 'Cherokee Wax', 'Top Notch Golden Wax' and 'Goldcrop'. Here's a labor-saving tip on beans: don't water them in after sowing; it delays sprouting.

Salad Stuff

Salad greens are usually trouble-free, except head lettuce, which sometimes will not head up. 'Mission', a new head lettuce, shows promise because of its supposed resistance to turning bitter in hot weather.

Cabbage and cauliflower can be considered low maintenance if you plant them early enough. Those maturing in summer can be reduced to leafy lace by the cabbage worm. Some good early cabbage varieties are 'Golden Acre', 'Emerald Cross', and 'Badger Market'.

Tomato varieties are unlimited. Once we grew 100 varieties at the Kishwaukee test plots. Even with student help we found that was just too many to evaluate. There's a limit to how many tomatoes you can taste before being satiated. Personal opinion and low maintenance suggest 'Quick-Pick', a superbly flavored 60-day variety. Other excellent new tomatoes are 'Floramerica' and 'Champion'.

For peppers try the new 'Patio Bell' if you can find it. Its thick walls make it ideal for stuffing.

Among radishes 'Crimson Giant' deserves a special attention because it will not become pithy if harvest is delayed.

A Bunch of Others

Corn is not for the minimum maintenance garden. It takes up too much space in proportion to yield. The same is true for potatoes. A possible exception is 'Explorer', the new potato grown from seed. The superior flavor of freshly dug potatoes make 'Explorer' worth considering.

Kohlrabi, which sounds like an unlikely candidate, also has a place in the low maintenance garden. This is because of the introduction of 'Grand Duke', a new variety. My observations indicate a slightly improved resistance to cabbage worm over the Vienna types. However, that's not its main claim to garden space. The flavor is outstanding. Possibly it could be described as "cabbage-like but delicate as celery."

Bush-type pumpkins, cantaloupes and

squash also merit attention in the low-maintenance garden. It's certainly easier to keep track of a bush variety than a rambling, sprawling vine.

Books

Some delightfully opinionated books—some that may differ from the Extension Service "party line"—are listed below. Some may be out of print. Nevertheless, they are worth a search. You'll appreciate their "second opinion."

All About Vegetables. Ortho Books, San Francisco, California

Bianchini, Corbetta and Pistoia. *The Complete Book of Fruits and Vegetables.* Crown Publishers, Inc., New York, New York

Carleton, R. Milton. *Vegetables for Today's Gardens.* D. Van Nostrand, Florence, Kentucky

Eden, Jack. *The Garden of Eden.* Schiffer Publishers, Ltd., Exton, Pennsylvania

Engh, Rohn. *A Very Simple Garden Book: Vegetables.* Paul S. Eriksson, Middlebury, Vermont

Faust, Joan Lee. *The New York Times Book of Vegetable Gardening.* Times Books, New York, New York

Gourmet Gardening, Organic Gardening. Rodale Press, Emmaus, Pennsylvania

Hollander, Timothy and Susan. *Burrage on Vegetables.* Houghton-Mifflin Co., Boston, Massachusetts

Jankowiak, James. *The Prosperous Gardener.* Rodale Press, Emmaus, Penn.

Marton, Beryl. *Out of the Garden Into the Kitchen.* David McKay Company, Inc., New York, New York

Moore, Larry. *Basic 20 x 30 Backyard Garden Guide.* Andrews & McMeel, Inc., Fairway, Kansas

Newcomb, Duane. *Growing Vegetables, The Big Yield/Small Space Way.* Houghton-Mifflin Co., Boston, Massachusetts

Editors of Rodale Press. *The Organic Gardeners' Complete Guide to Vegetables and Fruits.* Rodale Press, Emmaus, Pennsylvania

Raymond, Dick. *Down to Earth Vegetable Gardening Know-How.* Garden Way Publishing, Charlotte, Vermont

Editors of Organic Gardening and Farming. *Unusual Vegetables.* Rodale Press, Emmaus, Penn. 

MORE FUSS-FREEING IN THE VEGETABLE PATCH

Get soil tested before you get serious about vegetable gardening. Use raised beds if there's any problem with drainage. Use raised beds also for earlier soil warmth, thus earlier germination. If you use year-round mulch, pull it back to expose soil ten days or so before you figure to plant. Soil will warm up much faster.

Use "determinate" tomato varieties, they have shorter, bushier growth habits. Use tomato cages of reinforcing wire, hog fencing or homemade of wood; make cages 2½ feet in diameter and four feet tall, with mesh big enough to reach through and pick a big old Beefsteak or Whopper and get it out without juicing it—or just mulch beneath tomato plants and let them sprawl.

Rotate vegetable crops, even though you're using disease-resistant varieties, to prevent buildup of insects and disease organisms in the soil. Alternate root crops with top crops. Especially avoid planting tomatoes in the same spot two years in a row.

Fine seeds, like lettuce and some herbs, can be mixed with soil and sifted through an old window screen. The screen can then be propped on bricks placed under each corner above the seeded area as a protection against heavy rain.

Suspending plastic netting from early on over cabbages and their relatives may be worth your time to help prevent cabbage worms.

Smokers should wash hands before handling tomato, potato, eggplant and pepper plants. There's a mosaic disease of tobacco that can be transmitted to these other members of the nightshade family.

Plant seedlings and transplants in the evening. They will need less initial watering-in than if planted in daytime.

Plant herbs and salad vegetables (including cherry tomatoes, radishes and green onions) near the kitchen for quick picking. Harvest-in-a-basket-type crops like squash, corn, regular tomatoes and beans are usually better grown in a conventional garden.

Wide-row culture with plants close together is a great way to garden, but plants must not be too close. If every seed sprouts and thinning is called for, try cutting at soil level with scissors. It's faster than pulling and does not disturb the roots of those you leave.

If your garden gets less than eight hours of sun each day, you won't get results like those in seed catalog pictures. If the shade on your patch comes from walnut trees, you're really in trouble. Tomatoes especially suffer from allelopathic effects of juglone, a natural chemical in walnut roots that discourages the growth of many other nearby plants.

Plant radishes (quick to germinate) to mark rows of lima beans and other sleepy seeds.

It almost goes without saying that one of the easiest ways to reduce vegetable garden maintenance is to purchase fewer seeds and plants.

Use edible plants in ornamental ways. Herbs and vegetables offer form and color in places where annuals are traditional. Fruit trees can double as background flowering trees; strawberries perform well as small area groundcovers; blueberries are good ornamental shrubs if soil is right.

Never skimp on soil preparation if you want good results. Work flower and vegetable beds deeply, incorporating peat moss or humus and whatever minerals the soil test results indicate are needed. Don't spend too much time and energy pulverizing soil in planting areas. You can create problems by overworking soil and a few little clods won't hurt anything but your pride.

Potted vegetables and annuals (in peat pots, plastic market packs, etc.) respond better and faster if rootballs are moderately disturbed at planting.

Compost bins are worth the trouble. Humus is magic—black magic. If your property will allow the informality and you're in no hurry, just a pile of trash will turn to compost eventually.

Use black plastic trash bags to speed composting. Stuff the bags with moist organic matter, tie tightly and get usable humus in as little as a month.

—Alan Cook, *et al.*

MINIMAL MAINTENANCE TREES AND SHRUBS

Michael A. Dirr

The ideal low maintenance tree or shrub would not have disease or insect problems. It would grow in any soil without fertilization and have a life expectancy of at least fifty years. To reduce pruning needs, growth rate would be slow. It would thrive under the record extremes of heat and cold for the area. Flowers, if any, and leaves would be small. It would have no fruit to scatter on the ground. Such a plant is an ideal that is unattainable. No plants in a landscape setting are free from maintenance. They must be planted—they don't appear as part of a natural succession process—then there is some necessary watering, fertilizing, weeding, pruning, spraying and praying.

However, there are some plants that display amazing durability, surviving in spite of cultural neglect and biological obstacles, although none can be universally recommended for planting in all parts of the world, or even of the United States.

The following plants are some of those with low maintenance that can be grown over a large part of the country.

Trees

Hedge maple (*Acer campestre*) displays excellent drought and wide pH tolerance. It is round-headed, medium-sized (40'), has dark green leaves that may turn yellow in autumn. Zones 4 to 8.

Italian alder (*Alnus cordata*) is not well known but deserves more exposure. It displays both dry and moist (almost to wet) soil tolerance. It has a lovely soft pyramidal habit and glossy dark green leaves. Injury occurs at -20°F but only results in late leafing and in my experience did not kill the tree. Zones 5 to 7.

The handsome rich brown exfoliating bark of river birch (*Betula nigra*) is an ornamental plus for this rugged native tree.

River birch (*Betula nigra*) is native from southern Minnesota to Florida and Delaware to Kansas. A possible drawback is that bark is not white. The exfoliating salmon-brown to cinnamon-brown bark, however, may be just as lovely as white bark to the unbiased eye. It has excellent heat and cold tolerance, but requires acid soil and ample moisture. A new cultivar is 'Heritage'. Zones 4 to 9.

European hornbeam (*Carpinus betulus* and cultivars). It is unfortunate that architects, designers and nurserymen use this species so sparingly. Excellent foliage, hand-



George Tidmarsh



The native saucer magnolia (*M. x soulangiana*) blossoms profusely even as a very young tree.

many cultivars are adapted on both coasts and in most northern and southern states. A small (to 25'), often multi-stemmed, tree. Zones 5 to 9.

American hop-hornbeam (*Ostrya virginiana*) is one of my favorite native trees. One cannot traverse woods in eastern North America without passing, knowingly or unknowingly, close by this species. Interestingly, it tends to inhabit rather dry, rocky sites and often exists as an understory tree. It tolerates dry and highly alkaline soils. It has been used with limited success for street and campus plantings. The shaggy bark, clean foliage, hoplike fruits and winter catkins are interesting. Zones 4 to 9.

Chinese pistache (*Pistacia chinensis*) offers superlative autumn color to southern and western gardens. At its best, the coloration is the rival of that produced by sugar maple. The rich yellows, oranges and reds light up the landscape and the leaves often hold on until November. The branching habit is irregular. Chinese pistache tolerates dry soils and varying pH levels and has no insect or disease problems. It is best suited to Zone 7 and south.

Chinese or lacebark elm (*Ulmus parvifolia*). I am impressed out of my horticultural socks by this round-headed, 40-50'-high tree with attractive small dark green leaves and mottled (quilt-worklike) exfoliating bark. *Ulmus parvifolia* is often confused in the trade with the inferior, weedy Siberian elm (*U. pumila*). Adaptable from Boston to Van Nuys and Chicago to Orlando. For southern regions, there are several cultivars ('Sempervirens', 'Brea', 'Drake', 'True Green') with semi-evergreen to evergreen tendencies. Zones 5 to 10.

Japanese zelkova (*Z. serrata*) is another member of the elm family with low-maintenance requirements. Somewhat vase-shaped habit, dark green foliage, good yellow-to-wine-red autumn color and handsome bark contribute to its landscape value. This is another excellent plant for difficult sites. Zones 5 to 9.

some steel-gray sinewy bark and wide soil tolerances make it a choice plant. 'Columnaris', 'Fastigiata' and 'Globosa' are upright forms suitable for screens. Zones 5 to 7.

Ginkgo (*G. biloba*). For most of the United States and southern Ontario, this is a magnificent and adaptable species. For 150 million years it has been reproducing in an essentially unaltered form, which says something for its adaptability to changing temperatures, photoperiods and pollutants. The golden yellow autumn color is legendary. Try to plant males because female trees bear malodorous fruits. Zones 4 to 9.

Saucer magnolia (*M. x soulangiana*) is seldom considered a trouble-free landscape plant. However, one only has to sample the ornamental vegetation in urban landscapes and it becomes obvious that *M. x soulangiana* is alive and thriving. How often have you sprayed your magnolias for any serious insect or disease? *M. x soulangiana* and its

Shrubs

Bottlebrush buckeye (*Aesculus parviflora*) is one of my favorite shrubs. The superb white flowers occur in 8"-to-12" terminal cylindrical racemes in June or July. Flowering well in sun or shade, it makes a great plant for the shrub or woodland border. The leaves are free of the diseases that afflict certain other *Aesculus* species. Although native to the southeast it is perfectly hardy in the Chicago region. Zones 4 to 9.

White fringe-tree (*Chionanthus virginicus*) ranks in the first order of ornamental shrubs that can tolerate adversity. I have never observed any serious insect or disease problems, although scale occasionally has been reported. More impressive is its cold hardiness. It has flowered profusely in Maine and Minnesota, even though it is a southeastern native ranging from southern New Jersey to Florida and Texas. The fragrant, fleecy white flowers appear in May or June on fe-

male plants and are followed by bluish fruits. Sexes are separate but both have attractive flowers. Zones 4 to 9.

Forsythias. Previously never one to tout forsythias for anything but a bright blast of color, my opinion has softened over the years. Forsythias are *tough* plants. They withstand soot, grime, salt, sand, clay, acidity and alkalinity and still look good. They require pruning, but otherwise will grow in spite of cultural obstacles. The best of the lot include the *F. x intermedia* types and *F. viridisima* 'Bronxensis'. Zones 5 to 9. (*F. ovata*, a rounder-leaved Korean form with lemon yellow flowers, is hardy in Zone 4.)

Witch-hazels (*Hamamelis* spp.). The warm sun of an early February day produces an explosion of beautiful yellow flowers on *H. vernalis*, a sturdy, multi-stemmed shrub. The witch-hazels, Chinese, Japanese, vernal, and the hybrid *H. x intermedia*, may show color from January to March. Common witch-hazel (*H. virginiana*) blooms in

Rochie



The Chinese witch-hazel (*Hamamelis mollis*) has snow- and ice-proof sulfur yellow blooms with mahogany centers in late winter or early spring.

autumn. They are adaptable, noble shrubs. Most witch-hazels including *H. mollis* are hardy in zones 5 to 8 although *H. virginiana* and *H. vernalis* are hardy in Zone 4.

Hollies (*Ilex* spp. and cultivars). Hollies come in all shapes and sizes, degrees of leaf retention, fruit colors, cold hardiness and soil preferences. One of the best, winterberry (*I. verticillata*), is a deciduous, red-fruited member of the genus. It is one of the most adaptable hollies, abhorring only high pH soils, and is native from Maine to Florida. There are yellow- and orange-fruited forms as well as others selected for heavy fruit set and good autumn color. Most hollies are evergreen and easy to grow. Unfortunately, American holly (*I. opaca*), is subject to disfiguring attacks of leafminer insects. An interesting new group of evergreen red-berried hollies are the cultivars of *I. x meserveae*, called the "blue hollies." There are hollies for every part of the United States except the extreme north.

Bayberries (*Myrica* spp.) are excellent landscape plants and can be grown in most parts of the country. Northern bayberry (*M. pensylvanica*, Zones 2 to 6), southern wax-myrtle (*M. cerifera*, Zones 6 to 8), and California bayberry (*M. californica*, Zones 8 to 10) are deciduous-to-evergreen shrubs or small trees that display good salt tolerance

and soil adaptability. Chlorosis will occur in high pH soils. The leaves are fragrant and the small gray waxy fruits that occur on female plants offer winter interest.

Spiraeas. Tough, durable and almost weedlike in their ability to survive would be the proper way to describe many of the spireas. The summer flowering, low-growing group in particular has much to offer. Occasional pruning to keep them from becoming untidy is usually their only need. Since they flower on new growth, the pruning can be accomplished in late winter, with normal flowering taking place in late spring and summer. *S. x bumalda* cultivars 'Anthony Waterer', 'Crispa', 'Froebeli', and 'Gold Flame' are excellent. *S. japonica* var. *alpina*, 'Atrosanguinea', and *S. j.* 'Little Princess' are also choice. Zones 5 to 9.

Viburnums. Many gardeners know the standard viburnums but there is now a new group of high-quality, adaptable, trouble-free selections being marketed. The U.S. National Arboretum has introduced a wealth of improved cultivars including 'Cayuga', 'Alleghany', 'Chesapeake', 'Eskimo', 'Erie', 'Iroquois', 'Mohawk', 'Shasta' and others. They offer improvements in flower, foliage, habit and disease resistance. The only limitations are *extreme* cold or heat. Zones 5 to 8. 

Random Thoughts for Good Results

Plant small sizes of woody plants. They're easier to plant and often become established faster with less care than large sizes. But plant tree and shrub rootballs on undisturbed soil, or they'll settle later and be too deep. In heavy soils, plant with 5 to 10 percent of root ball above grade and feather loose soil up to make a sloping mound with a slight saucer-shaped depression around the stem or trunk. In light soils, plant level. In both cases, mulch.

Dwarf fruit trees are easier to tend, but some varieties have weak roots and require staking. "Genetic dwarf" varieties are usually superior. Ask your dealer, read catalogs carefully.

Prune woody plants while they are young; establish good branching patterns early; corrective pruning of old trees costs a lot. Summer pruning of deciduous trees and shrubs will check new growth more than will dormant-season pruning, resulting in less total effort. This is because in July foliage is still using carbohydrates from photosynthesis so no appreciable quantity is being stored in branches, trunks and roots.

Summer pruning is especially wise in dealing with suckers, those whiplike vertical shoots that seldom do any tree any good. Cut them cleanly at point of origin and paint the cut surface with a sprout-inhibitor. Tre-Hold is such a product. (Wound dressing is unnecessary for other pruning cuts.)

Soil tests are good investments. Nutrient-poor soil won't give good results; incorrect or excessive fertilizer may be worse. Maybe it's not fertilizer, but lime, that's needed. Ask your county soil extension agent about soil testing. 



Japanese iris and daylilies

HERBACEOUS PERENNIALS REDUCE LANDSCAPE MAINTENANCE

J. Paul Bowles

Role in the Landscape

Plants serve many landscape purposes. They can define spaces, making "rooms" out-of-doors, becoming the floor, walls, ceiling and focal points of such "rooms." These plants include herbaceous annuals and perennials, lawn grasses and woody plants (trees, shrubs, vines).

Masses of plants are used as proportioning agents, providing a scale suitable to surrounding areas and features. Repetition of the textures, colors or shapes of plants creates rhythms that unify landscape arrange-

ments. Single specimens or groups of plants can guide traffic, emphasize entrances or minimize unattractive elements such as utility company fixtures.

An herbaceous perennial is a non-woody plant living more than one year. Leafy tops of most perennials die off during winter. It may or may not die down during some other season. Magic lily (*Lycoris squamigera*) disappears twice in a year: new foliage grows from an underground bulb in spring, then dies away; flowers appear in late summer, die off after a couple of weeks, and the plant lies dormant through winter. Properly used

Name	Zones*	Ornamental Interest**	Ht.	Exp.***	Cultural Requir.	Suggested Use
<i>Achillea filipendulina</i> fernleaf yarrow	3-9	Y flws, June-Aug	3'	Su	endures dry soil	specimen, mixed border
<i>Anemone x hybrida</i> Japanese anemone	4-8	Pu to W flws, west 9 Aug-Oct	2½'	Ps-Sh	moist, peaty soil	specimen, massing, mixed borders
<i>Armeria maritima</i> sea pink	4-8	W to R flws, west 9 May-June on	10'	Su	dry, poor soil	groundcover, edging
<i>Asarum europaeum</i> European wild ginger	4-8	evergreen leaves	8"	Sh	rich, acid, moist soil	groundcover, edging
<i>Belamcanda chinensis</i> blackberry lily	5-8	O flws, July-Sept	2½'	Su	well-drained winter soil	specimen, mixed borders
<i>Cerastium tomentosum</i> snow-in-summer	3-9	W flws, May-June, W lvs.	6"	Su-Ps	dry, poor soil	bank cover, edging
<i>Coreopsis verticillata</i> threadleaf coreopsis	4-9	Y flws, June-Sept	2'	Su	well-drained soil in winter	specimen, massing, mixed border
<i>Cortaderia selloana</i> pampas grass	7-9	silvery plumes, Sept-Oct	10'	Su-Ps	moderate moisture	specimen
<i>Dicentra eximia</i> fringed bleeding-heart	4-9	Pi flws, May-Sept	18"	Ps-Sh	moist but well-drained soil	specimen, massing, groundcover
<i>Euphorbia epithymoides</i> cushion euphorbia	4-9	Y flws, Apr-May	18"	Su	well-drained soil	specimen, massing
<i>Festuca ovina glauca</i> blue fescue	5-9	bluish lvs	9"	Su-Ps	drought tolerant, good drainage	groundcover, edging
<i>Helianthus helianthoides</i> sunflower heliopsis	4-9	Y to O flws, July-Oct	5'	Su	moist, fertile soil	specimen, mixed border, screen
<i>Hemerocallis</i> hybrids daylily varieties	3-9	Y to R flws, May-Oct	4'	Su-Ps	size & flw time depends on variety	massing, edging, mixed borders
<i>Iris sibirica</i> Siberian iris	4-8	W to Pu flws, June	3'	Su-Ps	moist, acid soil	specimen, massing
<i>Lavandula angustifolia</i> true lavender	5-9	B flws, June-Sept	2½'	Su	well-drained even rocky soil	massing, edging, mixed borders
<i>Liatis scariosa</i> tall gayfeather	3-8	W to Pu flws, July-Sept	4'	Su, Ps	well-drained soil in winter in north	specimen, mixed borders
<i>Liriope spicata</i> creeping lilyturf	5-9	W or V flws, July-Aug, evergreen	10"	Su to Sh	needs moist soil in sun	groundcover, edging
<i>Lycoris radiata</i> magic lily	5-9	Pi flws, July-Aug	2'	Su-Ps	well-drained soil	specimen, mixed borders
<i>Miscanthus sinensis</i> eulalia	4-9	graceful plumes, Aug-Oct	5-7'	Su-Ps	leave old growth	specimen, bank cover
<i>Narcissus</i> hybrids daffodils, narcissus, jonquils	5-8	W or Y flws, Apr-May	15"	Su-Ps	best in well-drained soil	massing, mixed borders
<i>Phlox subulata</i> moss pink	3-7	W to R to Pu, Mar-May	5"	Su	good in rocky soil	groundcover
<i>Pulmonaria angustifolia</i> blue lungwort	3-8	B flws, Apr-May	1'	Sh	moist soil	groundcover
<i>Sedum spectabile</i> showy stonecrop	3-9	Pi flws, Aug-frost	20"	Su-Ps	dry soil	specimen, mixed borders
<i>Sempervivum tectorum</i> hen-and-chickens	5-9	evergreen, fleshy lvs	3"	Su	dry, poor soil	small-area groundcover
<i>Stachys byzantina</i> lamb's ear	3-8	white lvs downy west 9	1'	Su	well-drained soil	massing, edging
<i>Thymus pseudolanuginosus</i> woolly thyme	4-8	Pi flws, May	3"	Su-Ps	Poor, dry soil	groundcover, walks between flagstones
<i>Waldsteinia fragarioides</i> barren strawberry	4-9	Y flws, May-June, evergreen	6"	Su-Sh	moderate moisture	groundcover, edging

*Minimum annual temperature zones: see map on page 72.

**Color code: B = blue, O = orange, Pi = pink, Pu = purple, R = red, V = violet, W = white, Y = yellow

***Exposure code: Su = full sun, Ps = partial shade, Sh = full shade or very nearly so.



Moss pinks, dianthus and sedum tucked into the pockets in stone stairs need virtually no care.

in combination with complementary plants the transience of blooms adds charming naturalistic diversity to the landscape scene.

Perennials can substitute for other landscape elements. The small size and tolerance of adverse conditions of many perennial species allows them to replace grass or maintenance-demanding shrubs between walks and buildings or in similar confined areas. Even in a space as narrow as six or eight inches, creeping lilyturf (*Liriope spicata*) will thrive and bloom for many years. These qualities encourage use of perennials at constricted urban or commercial entrances where only heavily-trimmed shrubs had been before.

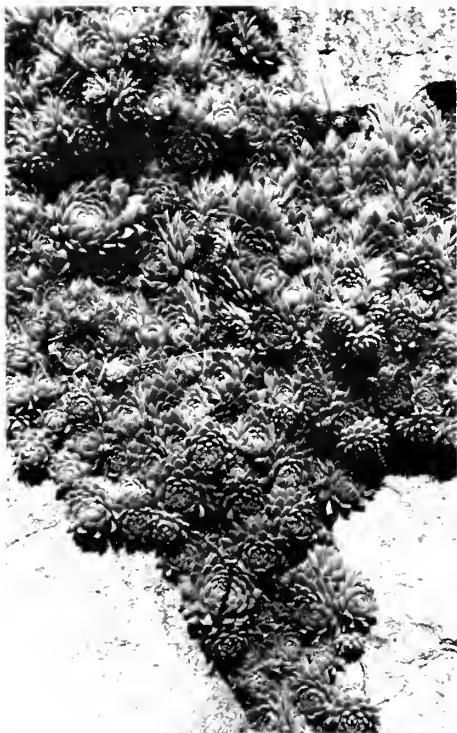
The trait of dense colonizing growth of many perennials means that they can replace mulch under and around established shrubs and trees although additional fertilizer is needed to satisfy competing roots. Unlike mulches, perennials renew themselves; a groundcover of woolly thyme (*Thymus pseudolanuginosus*) will only become denser as years pass. Under trees that throw shade so dense that grass won't grow, European

wild ginger (*Asarum europaeum*) spreads a handsome, shiny living carpet.

Low Maintenance Perennials

All plants—annual, perennial or woody—are low maintenance when chosen for the proper climate, exposure, soil and landscape use. Some plants are less specific in growth requirements than others, however. A low-maintenance perennial is generally one that meets the following criteria: 1. It lives and remains attractive for four or more years and does not require division or resetting in that period; 2. It is not invasive (that is, it doesn't spread, or if it does, new plants arise very close to the parent plant); 3. It does not have disfiguring or prevalent insect and disease problems; 4. It does not require winter protection after establishment; 5. It does not require pruning to remove unsightly spent flowers or fruits (excepting the removal of the previous years' growth); 6. It does not need staking.

These qualifications have qualifications: a plant pest-free in one area may be seriously



Hens-and-chicks (*Sempervivum tectorum*) will most obligingly cover vast areas of ordinarily difficult terrain.

infested in another; freedom from winter protection only if used in appropriate hardiness zones; a plant requiring staking in a petite courtyard might perform well in a naturalized setting.

The accompanying table on p. 32 lists perennials that, when used in the temperature zones, soils and exposure indicated will perform as low-maintenance plants. Although many of these plants may grow in other areas and conditions, growth or health of the plant will not then meet low-maintenance standards. The list is only a partial one; plants included were chosen to indicate the range of herbaceous perennials available. Unless specified, plants perform well in all soils except excessively wet or dry ones.

Additional Reading

Crockett, James Underwood, and the editors of Time-Life Books. *Perennials*. New York Times, Inc. 1972.

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Lambs-ears (*Stachys byzantina*) have an irresistibly fuzzy texture. Once established they are dependable as an edging or garden plant.



Truly low-maintenance rock gardening

PRACTICAL ROCK GARDENING

Marnie Flook

All gardens require a certain amount of work to plan, to prepare the site, to do the planting and the mulching. But once the garden is in place there can be a great difference in the upkeep required to keep it in top condition. This depends on the type of garden and the amount of preplanning that went into it.

The Japanese stone garden might be thought of as the absolute minimum maintenance garden—no insect problems, no watering, no diseases . . . in fact, no plants. But these gardens require meticulous day-to-day grooming.

Our subject here, the rock garden, certainly requires effort to plan and construct, but once established, routine maintenance can be minimal. Rock garden plants can be grown in a small space and often need less care than other plants in other types of gardens.

One might decide to build a rock garden to take advantage of an outcropping of rock and turn it into an attractive landscape feature. Or one might want to grow some intriguing small plants for the sake of the plants themselves.

How To Do It

To create a low-maintenance rock garden, you must understand what it is you want, then plan carefully and realistically before

starting. Study your property, taking note of the exposure and the soil conditions. Is it acid or alkaline? Clay or sandy? Read about rock gardening in some of the references cited below, and visit some gardens to see how other creative people have done it. No two rock gardens are alike. If you have a stony ledge where nothing seems to grow, you are lucky. You can have a natural rock garden with a minimum of effort.

If you do not have a natural area for rock plants, a "Structural Rock Garden," as described by James Bissland¹ could be the answer. He describes various rock walls and other structures which can be the basis of a garden. An excellent way to grow rock plants is to put them in the chinks of a stone retaining wall built against a slope or around a sunken terrace. If space is limited and flat, a flagstone terrace with small, rugged plants growing between the stones is something to consider. The stones provide a cool root run and the sand bed below is a good growing medium. A paved path with rock plants on each side is another way; a list of satisfactory and easy to grow plants for this purpose is included on p. 37.

A raised bed, either free-standing or built against a building foundation, is an attractive and practical way to grow rock plants. The bed can be built of treated lumber, railroad ties, stones, bricks or any other mate-



Raised beds are an excellent solution for limited space. Filled with a soil mix of soil, peat and sand, they get direct sun until noon, and are the home of over 80 species of rock plants, miniature shrubs and bulbs. The boxes are mulched with small pebbles, and rocks give the illusion of a rocky outcropping. The boxes are built of 4" x 4" treated timber and are lined with plastic to help retain moisture.

rial which can withstand prolonged contact with the ground. Lincoln Foster² describes such beds in detail. Also, see Frank Cabot³ in the Brooklyn Botanic Garden *Handbook on Rock Gardening*. With a raised bed, drainage and soil mixes can be controlled easily, maintenance is simplified and little space is required for an elegant garden.

The Soils

The condition of the soil used in growing rock plants is important. A fast-draining, moisture-retentive mix of loam, sharp sand and leaf-mold (humus) is ideal. Adding sand is beneficial to most plants in moist soils, but sand alone will do no good in clay soil. Peat moss or humus, as well as sand, *must* be added to clay.

A rock garden benefits from a mulch of stone chips, pebbles or gravel. Such a surface treatment has outstanding advantages: it lets rain pass freely through but retards

evaporation; it keeps the subsoil cooler during the summer; and it discourages weeds. Put on plenty of mulch after planting.

Plants that grow on rocky slopes in the wild, as well as their cultivated descendants, are rock garden plants. In fact, virtually any plant the gardener wants to grow in a rock garden becomes a rock garden plant. Annuals, biennials, perennials, shrubs or bulbs can be included if they are not too large. They can be from the mountains, bogs, woodlands, prairies, meadows, cliffs, deserts or tundra of any continent.

Part of the fun of rock gardening is to study the plants. Find out where they come from and you will know a great deal about what they require. Understanding the habit of growth will help you place each plant in the right place. Knowing your plants before you plant will save trouble later. Grouping plants which require similar cultural treatment is good practice, as is choosing plants

Suggested Low-Maintenance Rock Garden Plants

<i>Achillea ageratifolia</i>	<i>C. portenschlagiana</i>	<i>Iberis</i> sp.
<i>A. tomentosa</i>	<i>Chrysogonium virginianum</i>	<i>Iris cristata</i>
<i>Alchemilla alpina</i>	<i>Coreopsis auriculata</i> 'Nana'	<i>I. graminea</i>
<i>Androsace sarmentosa</i>	<i>Dianthus</i> 'Tiny Rubies'	<i>Lychnis alpina</i>
<i>Anemone pulsatilla</i>	and others	<i>Penstemon hirsutus</i>
<i>Aquilegia discolor</i>	<i>Draba aizoides</i>	'Pygmaeus'
<i>A. flabellata</i> 'Nana'	<i>D. olympica</i>	<i>Potentilla verna</i> 'Nana'
<i>Arabis caucasica</i>	<i>Epimedium</i> sp.	<i>Saponaria ocymoides</i>
<i>Arenaria montana</i>	<i>Gentiana scabra</i>	<i>Sedum dasypyllyum</i>
<i>Armeria juniperifolia</i>	<i>Geranium cinereum</i>	<i>S. middendorffianum</i>
<i>A. maritima</i>	<i>G. sanguineum</i> var. <i>prostratum</i>	<i>Sempervivum</i> sp.
<i>Astilbe chinensis</i> 'Pumila'	<i>Globularia cordifolia</i>	<i>Solidago spathulata</i> 'Nana'
<i>Campanula carpatica</i>	<i>Gypsophila repens</i>	<i>Thalictrum kiusianum</i>
<i>C. elatines</i> var. <i>garganica</i>	<i>Hosta venusta</i>	<i>Thymus</i> sp.
		<i>Veronica</i> sp.

adaptable to your specific exposure, soil, climate and other local conditions. Care and planning in the original planting is the best insurance against trouble later. Finally, after having carefully chosen and planted your plants in the conditions they like best, be sure to keep newly transplanted material well watered until it is established.

After plants are established water only as needed in dry weather. When watering, soak the garden thoroughly to a depth of three or four inches.

The rock garden may be planned and planted to require minimum attention, but do not expect to eliminate upkeep. Each spring some pruning, thinning out, removing dead foliage and general grooming will be necessary. Each plant should be top-dressed in the spring with a mixture of leaf-mold (rotted leaves from any woodland area), coarse sand and a little soil. Exposed roots should be covered, frost-heaved plants should be pressed back into the soil. Such top-dressing probably will provide all the fertilizer your plants will ever need.

Weeding must be done by hand, and—believe it or not—it can be a pleasant task that lets you get to know your plants as you work among them. Pulling weeds, including unwanted seedlings of the rock garden plants, should be done on a regular basis. Another good practice is to remove the spent flower heads. This will help the plant direct its energies into growth and prevent distribution of unwanted seed.

For membership information for the American Rock Garden Society (ARGS), contact the present ARGS Secretary, Norman Singer, Norfolk Road, S. Sandisfield, MA 01255. (After 1983 please consult the latest ARGS Bulletin for current name and address.)

References

1. James H. Bissland. *Common Sense in the Rock Garden*. A.T. De La Mare Co., New York, 1938, p. 25 ff.
2. H. Lincoln Foster. *Rock Gardening*. Houghton Mifflin Co., Boston, 1968; Soft-cover reprint, Timber Press, Beaverton, OR.
3. Francis H. Cabot. "Elevated Alpines." *Brooklyn Botanic Garden Handbook on Rock Gardening*, 1980, p. 57 ff.

Other Suggested Books

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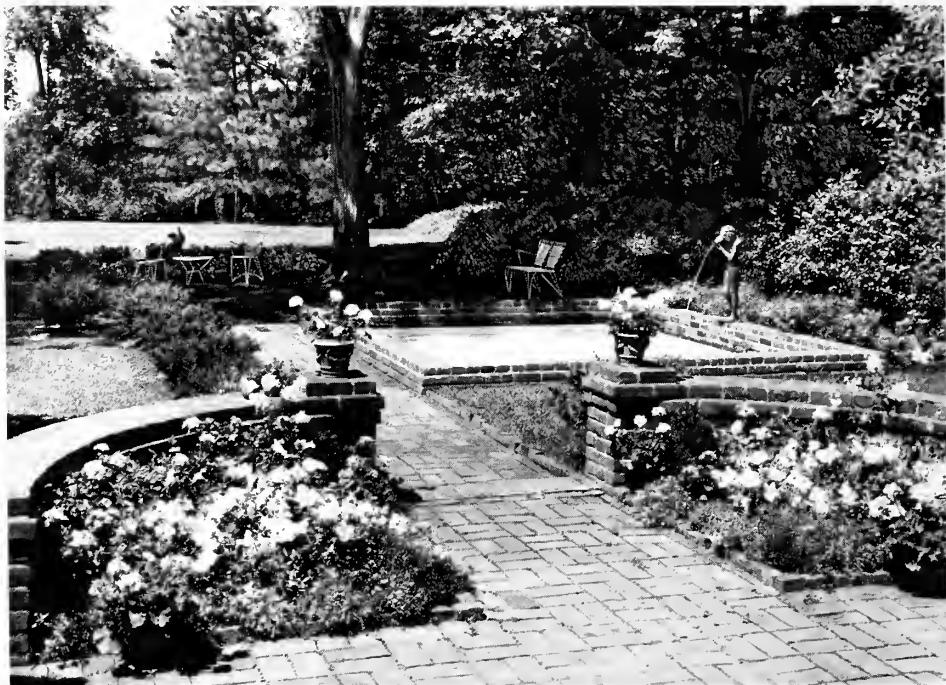
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Also: Quarterly Bulletins of the American Rock Garden Society. 



Petunias, geraniums, plumbago with holly hedge

ELEVEN EASY ANNUALS

Donna Hunter

Gardeners who want instant color and haven't much time to spend in the garden will do well to plant annuals. Many annuals are perfect container plants and work well as patio or entry accents. New homeowners can plant annuals for quick color while they decide on a more permanent landscape plan.

Under no circumstances do we assign magical properties to annuals. Most of them need good, or at least decent, soil. Good soil has sufficient but not excessive spaces between soil particles. The smaller spaces, the micropores, hold water against the pull of gravity. Larger spaces, macropores, allow water to drain away and air to enter so roots won't drown.

Adequate soil pH (between 6.0 and 7.0) and fertility levels are assumed during the balance of this article. If in serious doubt, have your soil tested by your local cooperative extension office.

Some annuals are easier to grow than others. The following eleven plants are easy to start from seed, bloom a long time in the garden and do well in nearly all parts of the country.

Marigolds, Zinnias and Scabiosa

Marigolds (*Tagetes erecta*, *T. patula*) are the backbone of the annual flower garden. They sprout so willingly a child can grow them from seed. Sow them indoors four weeks before the last frost or plant directly in the garden when frost has passed. Marigolds are rugged and weather resistant. The larger kinds (*T. erecta*) look good in the back of a sunny border while the smaller French marigolds (*T. patula*) are great edging plants. Colors are crisp and clear. Marigolds bloom in a newly developed white as well as the familiar orange, gold, rust, maroon and yellow. If you enjoy cut flowers but don't like

the marigold's pungent smell, try the new odorless marigold.

Zinnias are old-fashioned favorites. Their bright, clean colors shine in the garden. Most zinnias (except 'Thumelina') are excellent cut flowers. Plants range in size from six inches to two-and-a-half feet. Some zinnia blossoms are ruffled and shaggy while others are neat and symmetrical. Zinnias grow quickly from seed. Allow only four or five weeks for garden-ready plants. They will bloom in ten to twelve weeks from seed sown directly outside in warm soil. To reduce the chance of mildew, pick a sunny spot with good air circulation and plant six inches to a foot apart.

Scabiosa atropurpurea is a less-familiar annual that deserves more attention. Round flower heads look like small pincushions in lavender, light pink or deep maroon. Long thin flower stems are void of leaves and perfect for arranging. Scabiosa is best grown in the cutting garden or behind other plants since it grows waist high and can be somewhat lanky. If you start it from seed, allow four or five weeks indoors or sow outside after frost.

Cosmos, Petunias and Impatiens

Cosmos (*C. bipinnatus*) thrives on neglect. It actually does best in soil that is well drained and on the dryish side and with little fertilizer. Their loose, airy habit looks good in a mixed border. The single flowers are soft pink, white or lavender. Another cosmos, *C. sulphureus*, is a more compact plant with smaller, semidouble yellow or bright orange flowers. Both can be sown in the garden when warm or five to seven weeks earlier indoors. Cosmos are wonderful cut flowers and last a long time in the vase.

Petunias are usually purchased as small plants. Actually, petunias are easy to start from seed if you use a light soil mix. The seeds are so small that mixing them with a little sand before you sow them gives you more control of where they are sown so they don't bunch up in the medium. Leave seeds uncovered; petunias need light to germinate and respond well in warm soil (70-80°F). Allow eight to twelve weeks growing time before setting them out in the garden. Petunias can be planted in massed beds, borders or hanging baskets. In midsummer shear them

George Taloumis



Sweet alyssum and dwarf marigolds are two good annual foils for perennial chrysanthemums.

Eleven Annuals for Good Summer Bloom.

Plant	Needs & Uses:	Shade or semishade	Good for cutting	Good massed in beds	Good in containers	For edging
Ageratum				X	X	X
Alyssum				X	X	X
Celosia		X		X		
Cosmos		X				
Gazania				X		
Impatiens	X			X	X	
Marigold			X	X	X (dw)	X (dw)
Petunia				X	X	
Scabiosa		X				
Vinca	X			X	X	
Zinnia			X	X	X (dw)	X (dw)

dw = dwarf varieties

back halfway and fertilize lightly to encourage a new cycle of bloom.

Few annuals perform well in shade, which makes impatiens (*I. wallerana*) especially valuable. They can take morning or filtered sun, but need plenty of water, as they wilt in drying winds. Easy to start from seed, they take eight to twelve weeks to reach garden size. Seeds need light to germinate so keep them moist but leave them uncovered. Impatiens come in fiery orange, white and many shades of lavender and rose; some are bicolored. Try them in boxes or baskets as well as in the ground. The new double varieties are especially nice (each flower resembles a miniature rose). Since impatiens are really tender

perennials that are treated as annuals, you can take cuttings in fall and carry them through the winter indoors.

Celosia, Gazania and Vinca

For double duty, plant both *Celosia cristata* and *C. plumosa*. The soft feathery plumes of *C. plumosa* and the crested combs of *C. cristata* look good together in a massed bed. After you've enjoyed them in the garden for awhile, cut some to arrange indoors and some to dry for winter bouquets. Hang them upside down in a cool dark place to dry. Celosia grows quickly from seed and needs only four weeks indoors before outside planting.



Impatiens are a perfect solution to a low-light spot provided they receive enough moisture.



Gazanias from South Africa are subtly but vividly colored annuals of assertive personality, shown here with gerber daisies and sweet-williams.

If you have a hot, dry spot in the garden, gazania (*G. rigens*) is the answer. The plants, with their gray-green foliage, have large yellow, orange, cream or bicolored daisylike flowers held well above the leaves. Their low, spreading habit makes them an excellent ground cover. If you start from seed give them a four to six week headstart indoors.

Vinca (*Catharanthus roseus*, not to be confused with the perennial groundcover periwinkle, *Vinca minor*) is one of the most versatile, low maintenance annuals. Actually a tender perennial, it's grown as an annual in most areas. The deep green glossy leaves and the bright pink or white flowers look good in beds, borders, hanging containers and even as house plants. Vinca is rarely affected by pests or diseases. Give the plants eight to twelve weeks to grow indoors from seed.

Alyssum and Ageratum

Perfect for edging, rock gardens or containers, alyssum (*Lobularia maritima*) is a low, spreading plant. It flowers in mounds of white, pink, rose or purple and has a light, sweet scent. The seed can be scattered outside

in early spring. Press it lightly into the soil but leave it uncovered since the seed needs light to germinate. If you decide to start seeds indoors, allow four to five weeks growing time and plant outside when frost is past. With a light shearing in midsummer alyssum will cover itself with bloom until frost.

For a dazzling blue border, plant some ageratum (*A. houstonianum*). Most of the new varieties are low (4"-7"), compact and easy to grow. The small fuzzy multiple flowers come in various shades of blue, and also white and pink. The plants need extra water and light shade in very hot climates. If you grow them from seed, cover only lightly—they need some light to germinate. Start six to eight weeks before the last frost. Ageratum must have old blossoms clipped to continue a good show of bloom.

Suggested Readings

Annuals. Plants & Gardens Handbook #74, Brooklyn Botanic Garden.

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ALTERNATIVES TO CONVENTIONAL GARDENS

Kris S. Jarantoski

Planting above the ground, whether in tubs, containers, hanging baskets, troughs or wall gardens, is usually considered not only space saving, but also, and mistakenly, labor intensive. Container gardens and vertical gardens are not only a solution to limited space or a lack of unpaved soil to grow things in, but may also produce beauty and bounty with little input of time and energy.

Containers and Raised Beds

In many areas of our continent, the soil is not conducive to growing the more unusual species and hybrids preferred as ornamentals. The clay soil at the Chicago Botanic Garden, for example, with its pH of 7.2-7.8 and notably poor drainage, demands considerable time and labor to provide the right conditions for plant growth. Whether the problem is clay, sand or rocky outcropping, the homeowner often does not have the time and energy to improve the soil composition with organic matter and other amendments. Containers, with special growing media, eliminate backbreaking soil preparation.

Raised beds and containers require less effort in planting, weeding, grooming and harvesting. Because these gardens are elevated, there is less bending and stooping. There is little weeding between rows of plants and no soil compaction from pedestrian traffic since containers are usually placed on concrete or brick surfaces. This no-kneel gardening also has an obvious advantage for people who cannot easily bend and for people confined to wheelchairs.

Raised beds are less subject to rodent foraging. Rabbits and woodchucks, which often devastate ground level lettuce and cabbage family crops, bypass them when these vegetables are three feet above them.

Because containerized plants (and also hanging baskets) are usually isolated from other plants, they suffer less from insect attack and require less pest control.

Containers have flexibility of movement. When space is needed for a party on the patio

or balcony, or when a new design is wanted, containers may be moved to other places. During the coldest months tender plants may be moved inside. To make the moving as easy and fast as possible, large, heavy containers or tubs should be put on casters or wheels. Containers with wheels already attached and platforms with wheels that containers may be set on are commercially available. A rolling platform may be easily constructed with heavy plywood and wheels that can be purchased from a hardware or department store. A larger platform (Fig. 1) must be strong enough to hold a container that gets *very* heavy when watered. Reinforcement may be necessary.

Low maintenance aquatic plants grow well in containers. The main chore, watering, is eliminated, although a slowly running hose placed in the container once a week will keep the water from getting stagnant. A container (without drainage holes!) three feet in diameter and two-to-three feet in depth is adequate for pygmy waterlilies and lotus and emergent plants such as cattail (*Typha*) and arrowhead (*Sagittaria*). The container should be filled to within six inches of the top with soil rich in organic matter. Dwarf waterlilies and lotus should have about five inches of water above the soil. Once the container is planted and filled with water, little maintenance is required other than the addition of fertilizer tablets into the soil near the tubers every two weeks from June to August. Aquatics are heavy feeders. Since the tubers do not tolerate freezing, containers should be taken indoors in the North during the coldest months when the plants go dormant.

Espaliers

Espaliered trees and shrubs often save time when spraying, pruning or harvesting because the entire plant is usually within easy reach. Espaliered fruit trees provide heavy yields for the space they occupy while adding interest to walls and fences. Dwarf fruit trees

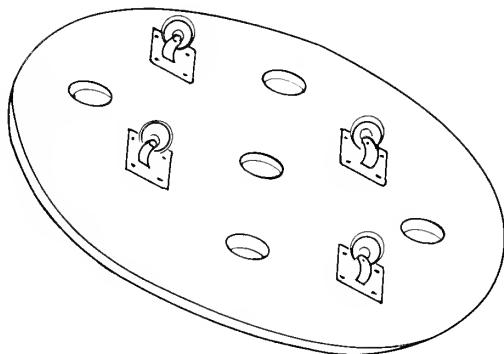
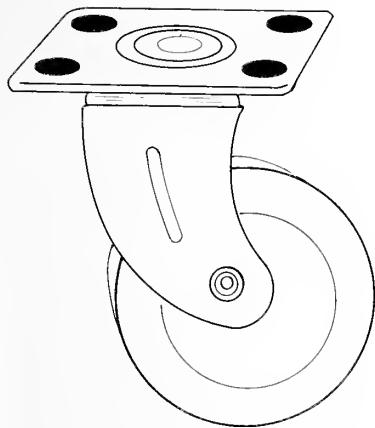


Fig. 1. A rolling plywood platform with heavy casters and drainage holes.

will save much pruning time because they grow slowly.

Hanging Baskets

Hanging baskets provide splashes of color in niches hard to fill any other way. The biggest maintenance task is keeping the growing medium moist. Sturdy hanging baskets may be easily constructed with a metal rod bolted through the drainage hole of a flower pot. Other holes must be drilled for drainage (Fig. 2). Plastic hanging baskets will not dry out as easily as baskets constructed from wire and lined with sheet moss although many people do not consider the plastic baskets to be as aesthetically pleasing as moss baskets.

Spaghetti watering tubes may be used to reduce watering time. Inconspicuous plastic tubing may be run along the roof or arbor beams from which the hanging baskets are suspended and spaghetti tubes may be run down to the plants along the chain or rope holding the basket. The gardener need only turn on the faucet to provide a gentle soaking of the baskets (Fig. 3).

Water Drainage

Water draining from containers on balconies can make enemies of the neighbors who have the balcony beneath. An easy solution to this problem is to place a piece of rain gutter below the drainage holes to catch and divert the excess water. The water may be saved and reused or an end of the rain gutter may be left open to discharge

water away from the balcony below (Fig. 4).

Vertical Gardens

Beside the advantage of saving space, vertical gardens cover unsightly walls, add privacy where there is no wall, show cascading plants to their best advantage, and provide a

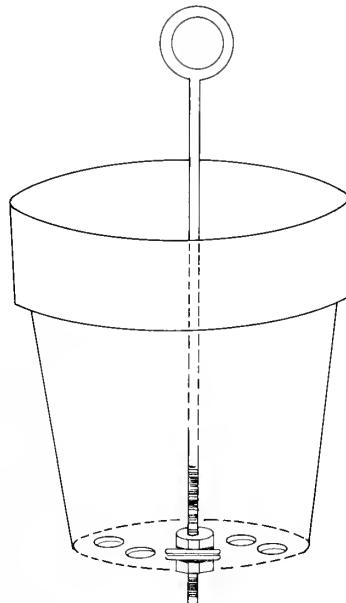


Fig. 2. A flower pot adapted for hanging. Note additional drain holes.

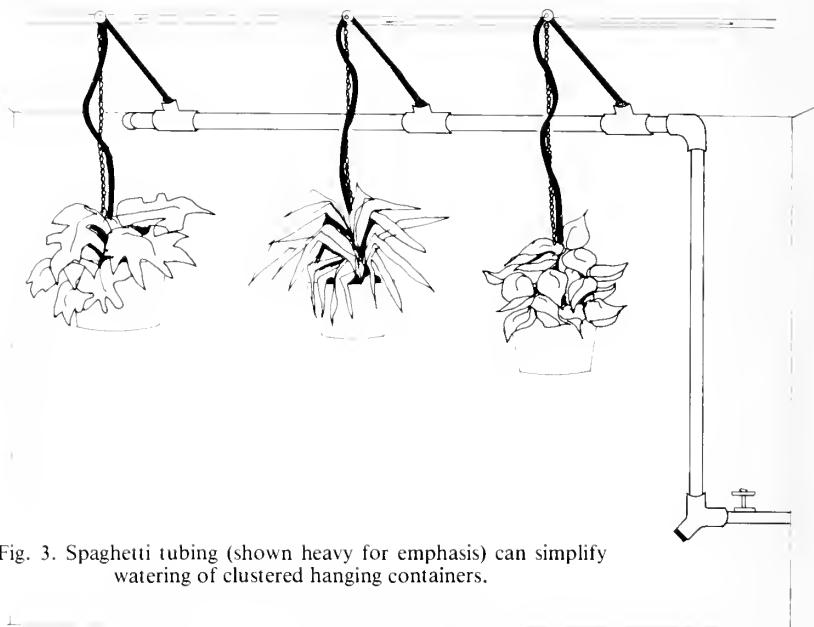


Fig. 3. Spaghetti tubing (shown heavy for emphasis) can simplify watering of clustered hanging containers.

new dimension to the landscape. A south-facing vertical garden allows planting earlier in the spring because the plants are above frost pockets and catch the warming sun.

A popular feature at the Chicago Botanic Garden is the small vertical garden in scale for the average homeowner (Fig. 5). A vertical garden is not hard to build. Essentially

it's a box several feet wide and high, but only four to eight inches thick. The side to be planted is formed with a latticed surface of sturdy strips. All lumber should be decay-resistant—redwood, cedar or pressure-treated pine.

Line the inside of the box with galvanized-wire mesh (hardware cloth) or fencing. Vari-

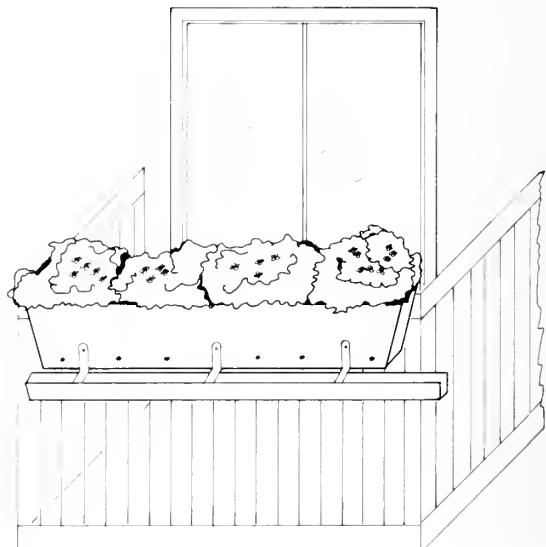


Fig. 4. A gutter under side drain holes can divert water from people directly beneath.

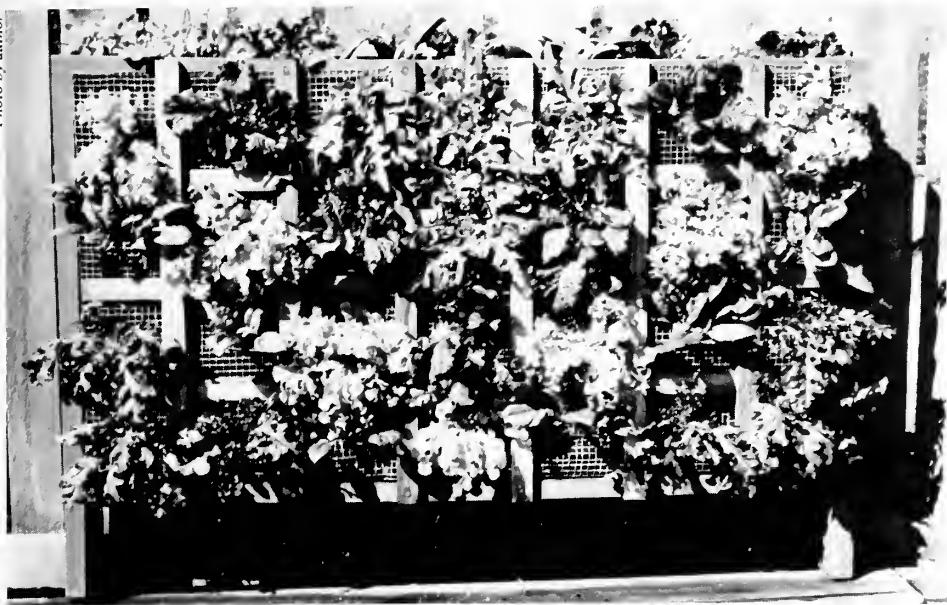


Fig. 5. The small vertical garden at the Chicago Botanic Garden. Such a garden can have vegetables, flowers or a mixture.

ous mesh sizes are available; get one that allows easy planting through the mesh. Inside the wire mesh place a lining of 4-mil black plastic and fill with a soilless growing medium such as peat and perlite with slow-release fertilizer; commercial mixes are available. Cut small slits in the bottom of the box for drainage. Then cut slits in the plastic and insert plants.

Watering is the only major maintenance. One might lay a soaker hose on top of the medium and let it run until water drains out the bottom. The top can be left open to take advantage of rain water, or covered with plastic or other kind of "lid" to allow total control of watering.

Try vegetable crops such as lettuce and spinach, and colorful annuals like impatiens and petunias, favorites at Chicago Botanic Garden.

Gardening aboveground not only saves space but can also save time and energy. Hanging baskets and containers can easily be changed with the seasons and plants spotlighted and appreciated more than if they are grown in large, earth-bound beds.

Suggested Reading

Container Gardening, Plants & Gardens

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Mixed container exhibit includes flue tiles

FLUE-TILE GARDENING

Patricia Talbert

Clay flue tiles in the garden are terrific. They are intended to line the insides of chimneys, but they can solve any number of garden problems with beguiling ease; in addition, they're attractive. Commonest colors are brick red and off-white.

I think of flue tiles as big terra-cotta pots without bottoms. They're readily available, fairly inexpensive, will never rot, and they provide raised planting space almost instantly. In one afternoon it is possible to create a large, fast-draining, raised garden of loamy soil—planted and ready for watering.

Probably the best thing about flue tiles is that they enclose. Fixing a readily discernable boundary between my growing areas and the rest of the soil in the world makes all

the difference in controlling soil and water.

Flue tiles come square, rectangular, oval and round, ranging in size from about eight inches in diameter and eight inches high to about two feet square and two feet high. Flue tiles don't weigh a lot, although they're much thicker-walled than clay pots and therefore more durable. A tile that is 13" x 17" x 12" weighs about thirty pounds, awkward but portable for most gardeners.

The various sizes and shapes make possible many patterns. Oval tiles, for instance, will smoothly follow a curve. Any shape can line a walk or edge a stair, be clustered or used alone, or can hold up a smallish mound of soil. They can also be placed on a



The depth of flue tiles permits deep rooting of the plants and control of the depth of the soil.

concrete pad or on a waterproofed rooftop.

I've pondered the wonders of a garden made entirely from these tiles, and while it might have the look of a hotel lobby in Guadalajara, plants would certainly grow well

there. I could grow anything in such a garden. Now that they're not fated to a sure death in my wet clay soil, Iceland poppies are exuberant in their tile nests. I could even grow carrots, long straight unbumpy ones.

I've filled rows of tiles with spring bulbs, topping them with bedding plants. They're great for bulbs because when the tops die back I can lift or tip the tile and pick out every last bulb. The separate cells make it feasible to keep red tulips from mixing with the yellow. Single pots are safeguarding my lilies from inadvertent shovel-slicing and accidental foot-trodding, as well as giving them ideal drainage. I planted a small tree in one of the larger tiles and added a campanula spill to soften the edge.

Edges in my garden can get murky pretty fast as weeds appear seemingly hourly. Weeding tile "pots," after all, is really quite simple because they are easier to reach and there is no question about where the rim is. [Ed. note: Tiles full of soil or other growing medium may crack when frozen. In cold climates it's best to use them only for annuals (including vegetables) so at least half of the medium can be removed for the winter.] ☘



Reasonably portable, flue tiles can be rearranged, perhaps with help, at whim.



The American ideal . . . the well-tended lawn

Good, thorough preparation for . . .

LOW MAINTENANCE LAWNS

Robert W. Schery

*[Ed. note: The largest demand for maintenance on the average American property is the lawn. How many mowings? Twenty-five? Four fertilizations? Innumerable waterings? Dethatching? Renovation? Chinchbug control? Sod webworms? *Helminthosporium* leaf spot? Volleyball blight? This handbook is studded with suggestions for eliminating all or part of that troublesome grass, but the lawn habit is hard to break. If you're hooked on turf, this article will help ease the pain.]*

Selection of Grass(es)

The first step in establishing a lawn is choosing suitable grasses. There are many species and cultivars, each with adaptabilities to various situations. Often a blend of several grasses is the best bet. Find experts with knowledge of the latest turf information—extension and university personnel, seed companies and experienced and successful

commercial turf contractors can be sources of reliable advice.

Preparation and Seeding

Low maintenance of a lawn should involve efficient use of options, not complete neglect. Absolutely no fertilization, for example, may so favor the weeds compared to the grass that higher maintenance becomes nec-

essary. So, when planting a lawn, provide a reasonable dowry in the very beginning.

Not much can be done for the root zone once a lawn is established, but soil cultivation before planting affords opportunity to mix in fertilizer—and lime, separately, if needed. (Be guided by a soil test if you are unfamiliar with your soil's characteristics.)

Renovation, which includes surface sowing, is possible but has less likelihood of complete success. In this method, the soil is scored with powered equipment (power rakes, turf thinners) which slices through the old turf layer and slightly into the ground, making a seedbed of sorts. Renovation is generally more successful if the old vegetation is first killed chemically.

A seedbed is most accurately sown with a mechanical spreader. But whether by hand or machine, sowing half the seed in one direction and the other half at a right angle better assures against vacant spots. Mulch—a light, protective covering provided by straw, loosely-woven burlap, string sphagnum or a commercial material for lawn contractors—helps get the planting off to a fast start. Such mulches break down quickly.

Unless the soil is fluffy, the new planting probably need not be rolled. Rain or watering settles the soil adequately, after which occasional light sprinklings, perhaps daily in dry weather, should suffice to bring up the seedlings. With plenty of moisture and warm ground, in August or September, new grass should be visible within two of three weeks.

Sod, biscuits of sod (plugs), or fragmented stems (sprigs) are widely used to start lawns in the South. Soil preparation should be as thorough as for seeding. Plant at once so the live grass does not dry out. After firming into place by rolling a newly-laid sod or pressing plugs and sprigs with the foot, keep the planting moist. Within six weeks new sod should be well rooted.

Later Care

Mowing. Before young grass reaches twice what will be its customary clipping height, mowing should begin. It ought to be frequent enough so that never more than half of the green leaf is lost at any one clipping; grass that has grown lanky has most of its green food-making tissues at the top of the leaf blade and suffers a breakdown of production if suddenly trimmed to stubble. In the North,

colonial bentgrasses are typically mowed slightly less than an inch tall, and bluegrasses, fescue and perennial ryegrasses 1½ to 3 inches (the newer, low-growing cultivars withstand slightly lower mowing quite well). In the South, Bermuda grasses are mowed like the northern bents; other species are mowed like bluegrass.

Low-cut bentgrasses and Bermudas may have to be mowed twice weekly but intervals of five to ten days are usually enough for the other species (during drought they often can remain unmowed).

Thatch. Luxuriant lawns produce an abundance of growth not always matched by decay of spent tissue. The resulting buildup of debris at the base of the sod is called thatch. Contrary to the general impression, lawn clippings add very little to the thatch. Rather, succulent leaf tips cut off in mowing readily decay and disappear, so collecting clippings doesn't do much to alleviate thatch. On the other hand, leaving clippings is an economy measure equivalent to one or two fertilizations per year.

The most economical thatch control is earthworms. Where earthworms are eliminated, as when certain pesticides are used persistently, thatch usually worsens. If the situation turns so serious that fertilizer, seed and even water cannot easily penetrate to the root zone, mechanical thatch removal provides temporary relief. For this the power machines earlier referred to do an effective job with a minimum of bother, though thatch diminution will be only temporary unless the causes for its formation are corrected. The duff produced by de-thatching can be swept up for the compost heap or for flower-bed mulching.

Aeration. Heavily-used turf, and lawns on soils which readily compact, might be further benefitted by aeration. This is accomplished with machines that remove pencil-like cores of soil. Spiking devices that merely press into the ground may actually compact the soil more, rather than aerate it.

Watering. Watering is necessary if you are to have any lawn at all in the arid Plains and the Southwest. In more humid parts of the country, watering, more a luxury than a necessity, keeps lawns from becoming seasonally scorched when weather is dry. Watering can be overdone, resulting in shallow rooting and encouraging soil compaction and intro-

QUICK TIPS FOR EASING LAWN CHORES

- Have soil tested (County Extension Service) to determine lime and fertilizer needs.
- Choose suitable grass type(s). Consult local authorities.
- If you need to apply pesticides, do so at the proper time to avoid wasted effort.
- Mow high, mow regularly, leave clippings.
- Eliminate isolated trees and shrubs by joining them into an "island" with mulch or groundcover.
- Reshape shrub, groundcover and flower beds to eliminate acute angles in the turf pattern.
- Keep low branches trimmed from trees; they are especially bothersome (and dangerous) for persons on riding mowers.
- Put the bird bath in groundcover or on paved or other non-turf area so you won't have to move it every time you mow.
- Contract for a person with a mower to cut your grass to avoid equipment maintenance.

ducing water-loving weeds such as *Poa annua* and nutsedge.

Water may be needed when the grass shows signs of wilting (as when it turns bluish or shows footprints for more than a few minutes). Irrigation will keep a lawn luxurious, but in most instances a lawn can turn dormant from drought without permanent damage.

Fertilizing. Modern turfgrass should be fertilized at least moderately in order to take advantage of the fine qualities bred into them. Bluegrass lawns should receive at least two pounds of nitrogen (N) per 1,000 square feet annually, most of it in autumn. Fertilizers formulated for lawns are rich in nitrogen, often with a ratio of about 5 parts N to 1 part phosphorus (P) to 2 or 3 parts potassium (K). An N-P-K analysis such as 27-5-12 is typical. Lawn fertilizers often contain some slow release nitrogen that doesn't give a sudden stimulation of growth followed by quick exhaustion. Use visual evaluation and periodic soil tests to determine whether your fertilization program is adequate.

Weed control. Even the best managed lawns will occasionally experience weed invasion or insect or disease attack. Weeds are probably the most ubiquitous nuisance. Fortunately, a number of excellent weeding aids are now available. Consult an extension agent or other knowledgeable local people about those suitable for your conditions.

Coarse perennial "field" grasses are really the only group for which there is no simple

selective means of elimination. Rather, all of the turf must be killed back with compounds such as glyphosate, and the treated area then reseeded. (See BBG Handbooks No. 71 and 73 for details on lawn weed control.)

Insect control. Many insecticides are restricted for environmental reasons. About the best that can be recommended if your lawn is attacked by chinchbugs, sod webworms, billbugs and similar kinds that damage the above-ground parts, is to treat according to label recommendations with one of the available biodegradable insecticides. If Japanese beetle grubs become prevalent, milky disease (a biological control often miscalled "milky spore disease") works reasonably well. Most of the time, lawns outlast insect attack and recover even without treatment.

Disease control. Disease control for the homeowner has limitations similar to those for insect control. Halting diseases effectively with fungicides is complicated and difficult—really a job for the professional.

Changes in weather frequently put a stop to disease, which in any event may have run its course by the time it is very noticeable to the home gardener. Planting with disease-tolerant cultivars would seem the easiest means for disease prevention, applicable for new lawns or when old ones are renovated.

Lawn service. Most of the lawn services take care of lawn fertilization and certain types of pest control (sometimes beyond the real needs of the lawn), but leave expensive

mowing to the property owner. Sometimes when maintenance or a specific problem is too much to handle it is wise to hire experts. However, a wealth of easy-to-use products has been developed for the homeowner, so that it is within the capacity of the non-expert to have a spanking good lawn while providing only the really necessary treatments.

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Natural Landscaping

A Minimal Maintenance Alternative

Betty Frankel

We gave away the lawnmower when we moved from our standard subdivision house to a new house on a wooded lot. That was nearly twenty years ago and we haven't missed the lawnmower or the lawn.

The bi-level house, tucked into a hillside, was designed to fit into the woods as unobtrusively as possible. We wanted to keep our six acres of mature beech-maple woods as a little nature sanctuary. In spring the ground is carpeted with wildflowers. In summer it is a cool refreshing green world, in autumn it has a golden ambience, and in winter it is stark and dramatic. Birds are a year-round delight.

Patios, decks and sturdy timber steps extend the house into the woods and verdant beds of myrtle, pachysandra, sweet woodruff and lamium form transitional areas. Ferns, transplanted from other places in the woods, keynote the entrance to the driveway, the front door and the beginning of woodland trails.

Several flowering dogwood trees planted near the house supplement a few native flowering dogwoods growing in the woods. Rhododendrons, mahonia and pieris by the front of the house and hemlocks along the lot line give winter color. Mostly, though, we have resisted the temptation to embellish.

Beds of flowers and vegetables would be out of character and are precluded by the dense shade. In a sunny spot along the roadside at the edge of the woods, however, the flowers have a country-garden exuberance that contrasts pleasantly with the woods.

The major chore is removing autumn leaves from the decks, patio and long driveway. The major problem has been falling trees and branches. The woods are old and many trees have come down. We remove those close to the house, cutting them for firewood, but leave those further away. They give the woods a natural appearance rather than the parklike look it once had.

All in all, though, our natural woodland landscaping has been easy to live with, requiring very little maintenance—no lawn mowing, no weeding, no pest control—and it has provided a beautiful setting for our home. It has proved to be an excellent alternative to conventional landscaping. ☘



Sweet woodruff (*Galium odoratum*)

Lawn a diminishing return? Try . . .

GROUNDCOVERS

Gayle Weinstein

The most used and most demanding ground-cover is turfgrass. It serves as the traditional American lawn on relatively flat, mower-accessible areas. But on steep banks, in narrow spaces and corners, in deep shade, among grouped shrubs and/or trees, for borders . . . there's an endless list of plants preferable to grass in these places.

Vines, prostrate and stoloniferous plants,

perennials, medicinal and culinary herbs (parsley makes a dandy small-area ground-cover), native "weeds" and more are potential groundcovers. Not only serviceable and often easier to maintain, groundcovers other than turf provide continuity and unity in the landscape picture.

Minimal maintenance in the future has a price in the present. There is no substitute for

proper soil preparation with incorporation of necessary organic matter, fertilizer, and perhaps lime or sulfur for pH adjustment. Planting techniques are important, too. For example, if planting wildflower seeds on a slope, apply a top layer of coarse gravel, broadcast seeds on the gravel and sprinkle thoroughly with water.

Just as important is plant selection for hardiness, sun or shade preference, water needs, traffic tolerance and texture and color harmony with the rest of the landscape. Species suitable in some areas may be either invasive or puny in others. Consult local authorities.

Plants that take more than two years to

colonize after reasonable spacing (6" to 12" apart for herbaceous plants, 18" to 3' for prostrate shrubs) are not suitable ground-covers. If your chosen species just won't cooperate within two years (three tops), rip it out and try another.

To help in weed control during the establishment period, use a mulch. Suitable applications are 2" of shredded bark for herbaceous plantings and 3" for shrubs. Mulch is applied before planting herbaceous ground-covers; it's easy to pull mulch back from a small area, plant with a trowel, and replace it. Shrubs with larger spacings are effectively mulched after planting.

Annual weeds in groundcover areas can be

Roche



The deep yellow flowers of Goldenstar (*Chrysogonum virginianum*) appear in spring in the midatlantic states southward.



All photos by Roche



At top, carpet bugle (*Ajuga reptans*) makes a dense shiny-leaved cover in very little time. Below, European wild ginger (*Asarum europaeum*) does well in shady areas. The 2-3" evergreen leaves are very glossy and handsome.



The leaves and flowers of bunchberry (*Cornus canadensis*) a low-growing herbaceous dogwood. It does well in moist northern situations.

controlled with proper application of appropriate herbicides. Read labels to be sure a given material is safe for your particular groundcover.

Additional Reading

All About Ground Covers. Ortho Books, Chevron Chemical Company, San Francisco, CA.

Atkinson, Robert E. *The Complete Book of Groundcovers.* David McKay Company, Inc., New York.

The Avant Gardeners' Guide to Groundcovers, Vol. 5, Nos. 14 and 15, May 1 and 15, 1973. Horticultural Data Processors, Box 489, New York, NY 10028.

Groundcovers, Special Circular 108, Pennsylvania State University, Extension Service, University Park, PA.

Groundcovers and Vines, Plants & Gardens Handbook #86, Brooklyn Botanic Garden.

Wyman, Donald. *Ground Cover Plants.* The Macmillan Company, New York. ☣



Purple coneflower (*Echinacea purpurea*) in prairie grass

PRAIRIE COMMUNITIES IN LANDSCAPES

Charles Gleaves

Our native American prairies are both a natural resource and an inspiration for low maintenance gardening. Many prairie species are excellent ornamental perennials which require a minimum of care. In fact, many of today's popular garden perennial species were taken from prairies; even more could be used.

Indeed, prairie plants can be used in landscapes in a way rarely seen in today's gardening. Natural prairie communities can be reconstructed by introducing an extensive diversity of species or they can be emulated in the garden with only a few carefully selected species to provide a particular ornamental effect. In either case they can form a stable, ornamental and (once established) minimal-maintenance garden community. And they can be grown throughout most of the country, not just where prairies appear naturally.

Unfortunately most plant communities are

not stable; they are susceptible to succession. In other words, the composition of most communities, unless controlled, constantly changes; and in gardening it is often for the worse. Stated in gardening terminology, weeds* appear. If weeding is a problem in conventional gardening, it can be a much bigger problem in natural landscaping if the desirable plants are unable to resist succession (i.e., weeds). This is why prairies are so desirable. In much of the nation they are the natural vegetation and can be maintained with very little effort.

In most of the rest of the country prairies can be maintained, if not quite so simply, still with relatively little effort. Prairie plants form dense tufts that block invasion of weeds, and it is thought that some may emit toxins which prevent the intrusion of in-

*Ed. note: Weeds are plants we don't want.



The "Prairie Patch"

Many people who have developed an affection for the beauty of prairies grow what is called a prairie patch. This patch can be any size. In it is thrown every species of prairie plant the gardener can find, or it can be restricted to the species native to the area. In many parts of the country without natural prairies, non-native species can be organized into a "prairie." Such a prairie patch provides year-round interest. Grasses sway in the breeze and brightly colored flowers decorate the planting from spring to late fall. Golden browns, pale oranges and occasional red fall colors brighten the autumn season, and winter brings an interesting variation of textures and heights with pleasing muted colors.

A naturalistic community of widely varied species is not the only alternative in prairie community gardening. Stable communities can be set up using as few as two, but preferably three or four, species. Such limited diversity allows establishment of a refined planting with a controlled decorative effect. An example is a planting in Ohio which is used as a border on a short slope around a birdfeeder. It performs as an ornamental display and as low cover for birds approaching the feeder. Little bluestem grass (*Andropogon scoparius*) is used to form the foundation of the planting. One-year-old seedlings were transplanted at spaces about 1 foot apart over the entire forty by ten foot area. Interspersed among the little bluestem is dense blazing star (*Liatris spicata*) which gives a brilliant flowering show during much of July. Other plants could be introduced such as prairie petunia (*Ruellia humilis*) for August flowers and New England aster (*Aster novae-angliae*) for brilliant blue fall flowers. Even without the additions the effect provided by the relatively unhindered little bluestem is very effective through most of the year, especially in the autumn and winter. It stands three-plus feet tall, turns a red autumn color and fades to orange in the winter. Decorative stems stand upright throughout most of the winter, often retaining fuzzy flower parts. Grassy clumps discourage weed growth.

Little bluestem is only one of the many ornamental grasses available to the prairie gardener. Prairie brome grass (*Bromus kalmii*), porcupine grass (*Stipa spartea*), prairie

Little bluestem grass (*Andropogon scoparius*), one of the grasses that can be used when establishing a prairie community.

compatible plants. But most importantly, from a management point of view, prairies thrive on fire. With their deep root systems and late emergence in the spring they are far more resistant to fire than most of their competitors, especially woody plants. Although fire is hardly a tool the average suburban homeowner can use, it is used safely and easily in a very wide variety of situations in prairie restorations and could be adapted to some landscape uses. Where burning is not feasible, severe mowing in late summer or early fall to avoid nesting birds can serve the purpose.

People's perception of what is proper can hinder the acceptance of prairies in landscaping. Most homeowners think the traditional lawn of turf grass is essential, and while turf grass has its place, that place is not necessarily every front yard in America, especially in areas where water shortages make water too valuable for casual use. A short-grass prairie in an area like Fort Collins, Colorado, for example, would make an acceptable, even excellent lawn without the cost and waste of essential natural resources. In an area such as Pittsburgh, a well-placed tallgrass prairie planting could be used to complement a turf grass lawn while reducing maintenance in proportion to the size of the planting.

dropseed (*Sporobolus heterolepis*), June grass (*Koeleria cristata*) and sideoats grama grass (*Bouteloua curtipendula*) are some of the ornamental grasses ranging in heights from about six inches to four feet. Big bluestem (*Andropogon gerardii*), Indian grass (*Sorghastrum avenaceum*), panic grass (*Panicum virgatum*) and (for wet sites) cord grass (*Spartina pectinata*) are good grasses for the four-to-eight-foot range.

For Flowers

Flowering plants are numerous and varied. There's a full spectrum of flower colors, blossoming times from spring till late fall, and heights from one to nine feet. Gentians, fringed orchid, lady's slipper orchids, shooting stars, lady's tresses and lilies are all found in various types of prairies and can be cultivated in the same low-maintenance program as the rest of the prairie.

In constructed prairie communities a dense planting is necessary in order to prevent weed encroachment. A word of warning; establishment may be a problem if the planting is sown directly by seed. Prairie seedlings are slower growing than their aggressive woody and herbaceous competitors, so careful weeding is necessary for one or more years to keep the site presentable while the prairie plants are establishing themselves. This can be a problem because it is difficult to identify prairie plants at the seedling stage. If seeds are used, and they are *much* less expensive than plants, they can be grown in a temporary nursery in easy-to-weed rows. After one or two years the young plants can be transplanted into the new garden.

Another way of looking at these constructed prairie communities is to compare them to ground covers. Ground covers are single-species plantings that are aggressive enough to maintain themselves with only limited weeding. With a prairie garden, a single species such as little bluestem can have one or more species of plants added to it to provide color in the spring, other species can be added to provide different colors in the summer, and still different species can be added for fall effect.

Carefully planned, a prairie planting can be as stable and easy to maintain, if not more so, as a monoculture ground cover and with a greater diversity of interest.

Additional Reading

Betz, Robert F. *Prairie Plants of the Chicago Region*. Morton Arboretum, Lisle, Illinois. 1965

Diekelman, John, and Robert Schuster. *Natural Landscaping: Designing with Native Plant Communities*. McGraw-Hill, New York, New York. 1982

Nichols, Stan, and Lynn Entine. *Prairie Primer*. University of Wisconsin, Madison, Wisconsin. 1978

Rock, Harold W. *Prairie Propagation Handbook*. Boerner Botanical Gardens-Whitnall Park, Milwaukee County Park System, Wisconsin. 1974

Smith, J. Robert, and Beatrice S. Smith. *The Prairie Garden: Seventy Native Plants You Can Grow in Town or Country*. University of Wisconsin Press, Madison, Wisconsin. 1980

Smyser, Carol A., et al. *Nature's Design, A Practical Guide to Natural Landscaping*. Rodale Press, Emmaus, Pennsylvania. 1982

Seed and Plant Sources

Applewood Seed Co.,
833 Parfet St.,
Lakewood, CO 80215

The LaFayette Home Nursery, Inc.
LaFayette, Illinois 61449

Midwest Wildflowers
Box 64
Rockton, Illinois 61072

Prairie Associates
6328 Piping Rock Road
Madison, Wisconsin 53711

Prairie Nursery
Box 116
Westfield, Wisconsin 53964

Prairie Ridge Nursery
RR 2, 9738 Overland Road
Mt. Horeb, Wisconsin 53572

Prairie Seed Source of Iowa, Inc.
P.O. Box 1131
Des Moines, Iowa 50311

Clyde Robin Seed Co.,
P.O. Box 2855,
Castro Valley, CA 94546

Windrift Prairie Shop
RD 2
Oregon, Illinois 61061

Wildflowers and Naturalized Exotics as Lawn Substitutes

Virginia L. Beatty

Grass, of all landscaping materials, is the least expensive to install but the most expensive and time-consuming to maintain. As lawn substitutes consider wildflowers and naturalized exotics (See the accompanying chart, p. 60).

Since the late 70s when the ordinances supporting manicured lawns were challenged and overturned in many communities, naturalized plantings have become an attractive alternative in urban and suburban landscape design. Adaptation of wildflowers and naturalized exotics to local conditions reduces the need for water and chemicals. Mowing and other maintenance are virtually eliminated except to control woody plant invasion. However, until they are established, wildflowers and naturalized exotics need as much care and attention as any other plants. They are an option, not a panacea.

Seeds and plants are available in increasing numbers from a variety of commercial sources. The *Source Book for Native Plants and Seeds*, 1982, is available from the Soil Conservation Society of America (7515 N.E. Ankeny Road, Ankeny, IA 50021) for \$3.00. For local information check with state and local native plant and wildflower groups, soil conservation service, and cooperative extension. ☺

George Taloumis



Purple gayfeather (*Liatris spicata*) and dark yellow black-eyed Susan (*Rudbeckia hirta*) are good color and texture foils.

NatureScape Wildflower Guide.**

Name	Zone	Erosion Control	Wild-flower Gardening	Persistence	Height	Season of Bloom	Color
* <i>Achillea millefolium</i> (yarrow)	1-10	x	x	x	3'	Su	W
<i>Asclepias tuberosa</i> (butterfly weed)	2-10		x	x	3'	Su	O
<i>Aster novae-angliae</i> (New England aster)	5-7	x	x	x	5'	Su	Pu
* <i>Chrysanthemum leucanthemum</i> (oxeye daisy)	1-10		x		3'	Sp	W
* <i>Cichorium intybus</i> (chicory)	1-10	x	x	x	4'	Sp-Su	Bl
<i>Coreopsis lanceolata</i> (tickseed)	2-10	x	x	x	3'	SP-F	Y
<i>Echinacea angustifolia</i> (black Samson)	3-7	x	x	x	3'	Su	Pu
<i>Echinacea purpurea</i> (purple coneflower)	3-8		x		4'	Su-F	Pu
<i>Gaillardia aristata</i> (blanket flower)	3-8	x	x	x	3'	Su-F	Y-R
<i>Helianthus annuus</i> (common sunflower)	3-9	x	x	x	9'	Su	Y
<i>Liatris spicata</i> (gayfeather)	3-8		x		5'	Su	Pu
* <i>Linaria maroccana</i> (toadflax, butter-and-eggs)	2-10		x	x	1'	Sp	Mx
<i>Monarda didyma</i> (bee balm)	5-8		x		4'	Su	R
<i>Oenothera erythrosepala</i> (evening primrose)	3-8		x		4'	Su	Y
<i>Oenothera pallida</i> (evening primrose)	3-8		x		2'	Su	W
* <i>Papaver rhoes</i> (corn poppy, Flanders poppy)	3-8		x		3'	Sp-Su	R-O
<i>Penstemon strictus</i> (Rocky Mountain penstemmon)	3-6	x	x	x	4'	Sp	Pu
<i>Ratibida columnifera</i> (prairie coneflower)	3-9	x	x	x	3'	Su	Y,R
<i>Rudbeckia hirta</i> (black-eyed Susan)	3-9		x		3'	Su	Y
<i>Solidago</i> spp. (goldenrod)	1-10	x	x	x	5'	Su	Y

*Naturalized Exotic

**Compiled by Virginia L. Beatty. Condensed from NatureScape, September 1981. Reprinted with permission.



At top, seaside goldenrod (*Solidago sempervirens*) will also grow well in garden soil with very sharp drainage. Below, the evening primrose *Oenothera fruticosa* with its golden-cupped flowers, is a typical example of the genus.

Local Native Plant Sources, Free

Watch for areas slated for the bulldozer, such as sites of new highways, shopping centers, strip mines, housing. It should be easy to obtain permission to collect native and naturalized plants just ahead of the progress.

Early spring is the time most likely to afford successful transplanting; late summer and early fall is next best for herbaceous plants, late fall next best for most woody species. ☘

MULCHES . . . NATURE'S EASY WAY TO GROW PLANTS

Doc and Katy Abraham

One of the best things to come out of the energy crunch is a renewed appreciation for labor-saving mulches. Home gardeners find that mulching is the easiest way to lick weeds, save time and water, and reduce wear and tear on the back. When you mulch, you borrow a tip from nature. Covering the soil with mulch reduces temperature fluctuation. A summer mulch hoards moisture and inhibits weeds. A winter mulch, added after the ground is frozen (it's better for plants to freeze wet than dry), helps prevent a phenomenon known as "heaving," which is due to alternate freezing and thawing, forcing plants up and out of the ground.

Mulches are a great labor-saving, economical means of growing better plants. Once hooked on mulching, gardeners wonder how anyone can grow outdoor plants without a mulch of some sort.

There are dozens of mulch materials and usually there's no danger in using too much of them. However, excessive amounts of organic mulches, such as sawdust, wood chips, peat moss, and others, used year after year, may cause periodic shortages of nitrogen (manifested by yellowing and stunting of plants). This can be prevented (or corrected) by adding fertilizer containing nitrogen.

Often we can be so satisfied with the cosmetic effect of mulching that we can overdo it, producing what is known as "mulch poisoning." This is the result of piling or mounding 12" or so of an organic material around a tree or shrub. This high mounding can foster the growth of stem and trunk cankers, encourage rodents and may even restrict the diameter growth.

Too heavy a mulch can cause fermentation; the result is formation of alcohol. In fact, alcohol can form in any decomposing organic materials under anaerobic (without oxygen) conditions. Alcohol in excess can be death to plants. To prevent it from forming, do not apply mulch thicker than four inches, prefer-

ably one to three inches depending on texture, and never pile mulch directly touching the stems of plants; leave a small depression around the trunks or stems for air.

Types of Mulches

Aluminum foil. This not only makes a good mulch, but checks aphids and thus reduces certain diseases spread by aphids. How it repels aphids is not understood, but it is believed that reflected light causes the insects to become disoriented and neglect reproduction. (*Ed. note:* Foil is not particularly aesthetic and is not recommended for prominent landscape use. Also foil must be removed from the garden before it breaks up and incorporates into soil. Aluminum in the soil is toxic to plants.)

Bark (shredded or chipped). Waste material of various particle sizes from lumber and paper industries makes a fine mulch. As a mulch and upon decomposition, bark has a rich, dark appearance. (*Ed. note:* Shredded bark is cheaper and a better maintenance aid than bark chips or nuggets. Nuggets don't stop weeds well, and tend to kick out onto walks and lawns.)

Buckwheat hulls. These are light, clean and do not mat. They decay slowly, but as they do they add humus.

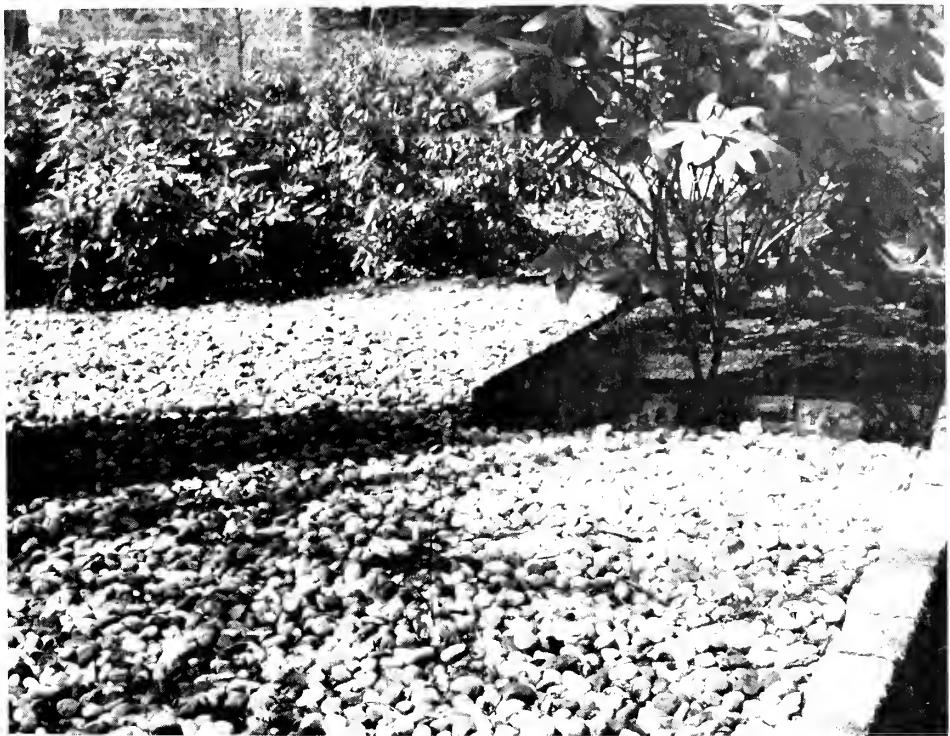
Cocoa-bean shells: This attractive mulch contains 3 percent nitrogen and 2 percent potash. It has a rich chocolate odor which dissipates in a week. Ideal for rose beds, flower beds and around trees or shrubs. May develop a harmless white mold which may be avoided by mixing them with sawdust in a 3-to-1 ratio.

Coffee grounds. Valuable as a soil conditioner and mulch, although low in nutrients (2 percent nitrogen, 0.4 percent phosphoric acid and 0.5 percent potassium). They are slightly acid, making them valuable around azaleas, rhododendrons and other acid-lovers.

Ground corn cobs. Excellent where avail-



A wood chip mulch, with bark chips for additional texture below the retaining wall.



River-smoothed stones used as a mulch-groundcover around broad-leaved evergreens contrast well with the dark leaves.



Salt hay used as a mulch for strawberries.

able. Use in rose beds, flower borders and vegetable gardens. A local feed mill or farmer can grind some cobs for you. Corn kernels among corn cobs may attract rodents for a brief time.

Evergreen boughs. All kinds are suitable. They allow air to enter and prevent smothering. Ideal for winter protection of perennials such as mums, foxglove and carnations. Needles are also useful for summer mulch. After Christmas holidays many organizations invite you to bring your old tree to a recycling center where the tree is ground up free of charge. Take advantage of such offers.

Gravel mulch. Crushed stone, pebbles and marble chips come in various colors, sizes and shapes and are easy to keep weed-free and to maintain around trees or shrubs. They make a fine lawn substitute under shade trees and in spots where eaves drip and splash mud against the foundation. Objections: children like to scatter them and lawn mowers further scatter them, endangering windows and people.

Grass clippings. This lawn by-product makes a neat mulch. Spread it two inches thick, fresh or dry. If left on your lawn, it adds extra humus and nutrients, so if your neighbor bags clippings, get them before the trash man does. (*Ed. note:* Grass clippings are troublesome in the vegetable garden because

small grass blades get into the harvest and are hard to wash off.)

Leaves. Most leaves (oak leaves are an exception) make a poor mulch because they pack down and prevent escape of moisture. They work best if shredded first, and are ideal if partially composted prior to use.

Newspapers. A cheap, effective, readily-available mulch. Use four or five thicknesses of unfolded sheets, or shred or tear sheets into a fine aggregate which can be put readily around trees and shrubs and in borders. There's an inexpensive shredder for home gardeners which strips the papers in a jiffy. Paper mulch can be covered with soil, peat, sawdust or other similar material. You can bury shredded papers with the family garbage in a plastic compost can in your garage.

Some people worry about the ink being toxic to crops or soil. The black ink, a mixture of carbon or lampblack in a mineral oil base, contains beneficial trace elements, but do not use newspapers with colored inks as these contain harmful heavy metals such as mercury and cadmium.

Plastic mulch. Black polyethylene makes a fine summer mulch, hastening maturity, conserving moisture and controlling weeds. Give the soil a good soaking and add necessary fertilizer before laying the mulch. Ideal in strawberry patches, where it reduces rot up to fifty percent and makes picking easier. Great for melons and sweet potatoes because they like extra heat in the soil. (Some crops such as peppers may not give increased yields.) In autumn pick up the plastic and store, as it can be used, if cared for, for about three seasons. While many extol the virtues of black plastic as a weed preventer, there is a drawback, too. Prolonged use around shrubs will encourage surface rooting. Then, if the plastic is removed or decays and is not replaced, there's danger from both winter freezing and summer drying. Also, if irrigation is practiced, or if you get excessive rain, a plastic mulch can trap too much water in the soil and affect growth. Clear plastic allows the sun's heat to penetrate and to raise soil temperature as much as 20°F. This is good for folks in areas of short growing season (and with clay soil) because it lengthens the growing season. Unfortunately, weeds also grow under the clear plastic.

Snow. Called "poor man's manure" because it contains small amounts of ammo-



Black plastic mulch, anchored with bricks or stones, should be stretched tight over the ground.



The open end of a tin can can be used to punch holes in plastic for planting or transplanting.

nia, nitric acid and other elements, snow is wonderful winter mulch when you get it. Tramp down snow around base of trees and shrubs to discourage bark-chewing rodents.

Straw. Wheat, oat or buckwheat straw makes good mulch but there are some disadvantages: untidy appearance, some weed seeds, and it's a fire hazard. If used, straw should be four to six inches deep to be effective. Hay has the same disadvantages plus many more weed seeds unless you use salt hay from low-weed salt marshes.

Sugar cane (bagasse). Commonly sold for chicken litter, bagasse is coarse in texture, stays in place, remains loose and springy and allows the passage of air, rain and melting snow. It has fine insulating value and should be applied 3" thick.

Sawdust. Contrary to common belief, sawdust is not toxic to plants or soils. It can be from hardwood or softwood trees, either

weathered or fresh. Use extra nitrogen to prevent yellowing of plant foliage, a common problem with many raw (unseasoned or unrotted) organic mulch materials.

Tobacco stems. Available in obvious parts of the country, tobacco stems have insecticidal properties (*Ed. note:* They also carry tobacco mosaic and should not be used near tomatoes, potatoes, eggplant or peppers or susceptible perennials or annuals.)

Wood chips. Arborists and utility-line clearance crews in your area may have wood chips at little or no cost. This waste product is a fine mulch if the source is disease-free. Chips aren't as attractive as shredded bark products, but do the job just as well and a great deal less expensively.

Suggested Reading

Mulches, Plants & Gardens Handbook
#23, Brooklyn Botanic Garden. 

More on Mulches

William Snyder of Akron, Ohio, pegs down black plastic with big staples made of wire coat hangers, then covers the edges with bark mulch for a neat finished look. He reports great vegetable yields.

Green plastic warms soil as does clear, but doesn't allow as much weed growth beneath.

A seldom-mentioned problem with plastic mulch is its extreme slipperiness when wet. Also, plastic is unsightly. It can be covered with a cosmetic layer of bark or pebbles, but invariably an edge or a high spot will show will all the glamour of a hanging slip.

In addition to the mulch materials mentioned by Doc and Katy Abraham there are many local materials (often free waste products) such as spent mushroom compost, stomped-out grapes, nut shells, clippings from a mattress factory, used hops from a brewery, de-thatching duff from lawns, coconut fiber, pine cones, Spanish moss, washed seaweed, salt hay, rubber mats that failed inspection, mine and quarry and brick-factory rubble, processed garbage . . . the mind reels.

Be cautious with untried materials. Brewery waste, for example, may make your garden smell like a honky-tonk. In Newark, Ohio, waste from a Tectum factory looks inviting but can't be used for mulch because it raises soil pH right off the color chart of a home test kit.

In climates where certain plants (azaleas come to mind) suffer frost damage to crowns and lower trunks, mulches in autumn can increase the problem by preventing radiation from the soil on frosty nights. It's a good practice to pull back mulch from such plants in fall before frosty weather, then put it back after soil freezes.

Reject grass clippings and de-thatching duff from lawns recently sprayed with herbicide.

Put necessary fertilizer in the soil before using plastic, aluminum foil or other non-porous mulches.

For areas to be planted with small groundcover or annual or vegetable plants (rooted cuttings, seedlings, peat-potted plants), spread organic mulch such as shredded bark first. It's easier to "plant through" mulch (scrape some away, plant, replace) than to apply mulch after putting in a number of small plants on twelve-inch centers or closer.

—Alan D. Cook

WEEDS

Alan D. Cook

Weeds we will always have with us, but there are ways to deal with them. Essentially, there are four ways of tackling weeds: kill them by some mechanical means; kill them by some chemical means; put something else there first (this method has two parts: use mulches or use plants other than weeds); finally, call them by another name.

Mechanical Weeding

Just as daily brushing of teeth is easier than getting dentures, weeding early and often is easier than one or two big clean-up attacks. Tiny weeds can be scraped with a scuffle hoe or hand weeder once a week or so much more easily than deeply-anchored long-ignored denizens can be whacked out with a grub hoe.

Around trees, under fences, at bases of walls, trimming is made easier with long-handled trimming shears or power trimmers. (A word of caution about electric or gasoline powered monofilament trimmers: those whirling plastic strings not only knock the tops from grass and other weeds, they knock bark from the base of shrubs and small trees. Many's the inadvertently-girdled sapling in modern-day suburbia.)

Chemical Weeding, General*

Glyphosate, sold as Round-up and Kleenup, has been eulogized as an across-the-board plant assassin with magical built-in safety factors. And it is good. Target plants soon absorb it, rendering it harmless. In contact with moist soils, it's quickly tied up by clay particles, but it remains dangerous in highly sandy soils and on leaf litter and some mulch materials. And, with one, or even several, applications glyphosate often has trouble with quack grass, zoysia, thistle, and poison ivy, among others. (Amitrole, another herbicide, will get most of these, but it has also been known to get small trees.)

A good way to apply either glyphosate or amitrole is with a hollow-handled tool shaped like a hockey stick. There are several versions on the market. A solution of herbicide in the handle moistens a felt strip on the "blade" of the hockey stick. The applicator is rubbed onto weed foliage, such as weeds growing above a lower groundcover or beneath shrub and tree branches, applying weedkiller to only, or almost only, what it touches. Many applicators of this ilk will drip. That can be a problem.

Another method of rubbing herbicide solution onto foliage is the old double glove trick. Put a plastic or waterproof rubber glove on your more dexterous hand, and don a cotton glove over that. Dip fingers of gloved hand in a strong mix of water and herbicide and then stroke offending plants. With either the hockey stick or glove, only a few leaves need be treated.

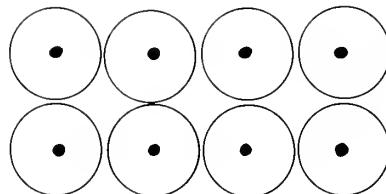
Chemical Weeding, Lawns*

Lawn weeds may be attacked by a variety of chemicals, some available only to licensed operators, many available to anyone. One of the most widely used is 2,4-D. And by far the greatest problems result from improper use of 2,4-D. Foremost is drift when spray-applied. "It wasn't windy" is not much defense when your neighbor sues for damage to his grapes. It's *always* windy enough to waft some 2,4-D mist. Granular 2,4-D preparations cost more at the counter but may be cheaper in the long run. Granules don't drift.

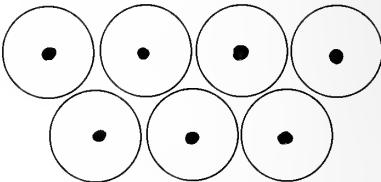
2,4-D doesn't kill everything. Grasses of course, but also broadleaved weeds can be exasperatingly resistant. Poison ivy, ground ivy, veronica, artemisia, and that nasty little viny thing that came with the daisy clumps from Aunt Polly . . . all those and more sometimes just wince but don't go away.

For many of the resistant weeds, Dicamba is useful, but it is also rough on certain trees, especially in sandy soil. Use Dicamba as a spray, wetting foliage of the weeds but allowing no run-off. Use a cardboard shield to protect flower and shrub foliage.

*Available herbicides change frequently as laws change and new materials become available. County agents and reliable garden store operators can keep you informed.



Wrong: this planting pattern leaves gaps, takes longer to fill in



Right: better foliage cover earlier

A new formulation sold as Trimec and as Trex-San, is a combination of MCPP, 2,4-D and Dicamba and is now cleared for home use. In combination the three materials give better results than when used separately. It's available in liquid and granular form.

Chemical Weeding for Annual and Shrub Beds*

For petunia patches, rose beds, and beginning groundcover areas, Dacthal has merit as a pre-emergence herbicide.

For existing plants, mechanically clean up the weed population. For new plantings, prepare a clean bed and plant the new plants. Then, in both cases, spray lightly with Dacthal right over, around and between the plants. You won't hurt them because this herbicide affects only germinating seeds.

Without unduly disturbing the newly sprayed soil surface, apply your favorite mulch as soon as the spray dries.

The spray-mulch combination should control seedling weeds for four to six weeks. By that time, if plants were properly spaced and have made good top growth, not much soil should be left exposed to sunlight and weeds of seed origin should not pose much problem.

Mulches

Even without the above pre-emergent treatment, mulches can reduce weeding to a level close to recreational proportions. (See *Mulches*, p. 62.) The "get 'em early" suggestion, however, is even more important when

organic mulches are involved. Some weeds growing in mulch emulate icebergs. You pull the four-inch-high weed and find a root system that won't fit in a trash bag.

Using Other Plants

Plant flowers, like groundcover plants, in closely spaced masses. Plant shrubs in beds, close enough to mingle discreetly at early stages of maturity. Plant vegetables in wide rows and massed patches. This last ploy will result in lower yield per bean plant but more beans and fewer weeds per square foot of garden. Plant in an alternating pattern rather than a checkerboard (see sketch).

Call Them By Other Names

Calling a weed, say, a "prairie plant," or an "edible native" may not change the plant, but it can change your attitude. (See article on p. 56.) This approach can go all the way from acceptance of a little untidiness to a full-fledged return to nature. A woodsy edge or the area beneath several close-together trees, or a strip or corner of the backyard—why not just let nature take over? Wood-asters, daisies, phlox, many grasses can provide no-maintenance beauty. Dandelions, dock, lambs-quarters can be eaten. So can wild raspberries, blackberries, grapes.

You can manipulate nature as much or as little as you wish, planting what you wish and roguing out the undesirables. Too much meddling may turn out to be more work than you had when you were conventional, but maybe you'll like the results better. ☘

TOOLS TO SAVE TIME AND EFFORT

Edwin F. Steffek

Every gardener, beginner or old hand, can profit from tools and sundries that will make work easier or save time. A simple one is twist-ties in a roll with a snipper attached. Better and easier than twine, old stockings or other make-dos, they go on fast, hold well for a season and don't cut plants.¹

In both garden and greenhouse whiteflies can be a great deal of trouble. The answer is yellow sticky strips.² Stir foliage gently on a sunny day and the pests go to the strips as through vacuumed. (Squares of plywood or masonite can be painted chrome yellow and coated with motor oil—*Ed.*)

Solar-powered greenhouse vent lifters³ need no wiring.

A turf edger with a short D-grip handle⁴ is easier for me than the conventional long handled edger.

I love my shredder-grinder which chops branches up to 1½ inches in diameter.⁵ Blowers for leaves, etc., on walks and drives⁶ are handy. The reverse, a garden vacuum cleaner⁶ sucks up debris.

A large two-wheeled garden cart⁷ carries larger loads more easily than wheelbarrows, and won't tip as readily.

Recently I saw a spade with a spring activated lever that lifts the soil and dumps it,⁸ a handy tool for those with back problems. A light-weight kneeling bench⁸ also helps back-problem sufferers.

Drip irrigation⁹ puts water exactly where it is needed without splashing, erosion or waste.

Easier for many of us than conventional hoes is the push-pull scuffle hoe.¹⁰

Sideswipe,¹¹ shaped like a golf club or hockey stick, wipes on herbicides so weeds can be treated with almost no danger to desirable plants. There are other brands on the market.

Do you have trouble filling trash bags with leaves and clippings? A trash bag holder¹² is the answer.

I have just barely scratched the surface of the many helpful products available. Study newspaper ads and catalogs; identify your needs and determine whether a given product is for you. And beware of cheap or flimsy construction and faddish gimmicks.

Sources

1. Available locally and from many catalogs.
2. Walter F. Nicke, Box 667, Hudson, NY 12534
3. Bramen Co., 20 New Derby Street, Salem, MA 01970
4. Many garden centers.
5. Inquire locally.
6. Parker Sweeper Co., Box 1728, Springfield, OH 45501
7. Garden Way Research, Charlotte, VT 05445
8. Gardens For All, 180 Flynn Ave., Burlington, VT 05401
9. Submatic Systems, Box 246, Lubbock, TX 79408
10. Most dealers.
11. A.M. Leonard, Inc., P.O. Box 816, Piqua, OH 45356
12. Antioch Garden Supply, 5225 Chouteau, Kansas City, MO 64119

Tool Tips

Purchase tools a bit bigger and stronger than you think you'll need.

Keep them sharp, clean and in good repair. Take power equipment (tillers, mowers, etc.) to the shop for repair and/or routine service in the off-season.

Paint handles of small tools orange or yellow so they can't hide in grass or mulch. ☘

INTEGRATED PEST MANAGEMENT (I.P.M.)

David G. Nielsen

IPM is an acronym for Integrated Pest Management, a rational approach for dealing with pests. The concept was developed in the 1960s when we began to learn about the undesirable side effects of relying solely on pesticides. Early proponents of IPM wanted to replace conventional chemical controls with natural enemies (parasites and predators), hoping that pests would be controlled without adverse effects on our environment. The definition eventually broadened to include the judicious use of cultural, mechanical, biological, genetic and chemical control tactics in an integrated manner to reduce pest populations to acceptable levels with minimum adverse effects on non-target organisms, including humans.

IPM is a total approach that deals with all pests (diseases, weeds, insects, rodents) that affect a management unit (in this case, a landscape planting or garden). Yield and quality is emphasized; pests are addressed only as they affect gardening goals.

Conventional pest control involves determining which pest is present, when it is vulnerable, and implementation of a control method at the correct time in hopes of achieving high pest mortality.

IPM demands a more in-depth approach that considers non-target organisms and long range forecasting before *and after* treatment. We are interested in not only the immediate but the *long range* effects on the target pest and on other organisms in the landscape or garden.

IPM pest control strategies that include conventional pesticides stress the importance of spraying to avoid the refuges of the pests' natural enemies and are used when pest parasites and predators are least vulnerable to poisoning. The strength of the insecticidal spray may be diluted so that it still kills pests but is less lethal to their natural enemies. Furthermore, a residual pest population can be tolerated or even cultivated so that natural enemies will be encour-

aged to remain in the area to regulate the infestation, thereby reducing the need for future pesticidal sprays.

Most plants can tolerate low and sometimes moderate pest populations before expressing serious symptoms of attack or important yield reductions. For this reason, IPM is a valuable alternative for dealing with pests in the urban environment where pesticide exposure should be minimized. Once the principles are learned and understood, IPM can be employed as a low maintenance approach to management of landscapes and gardens.

Implementing IPM

Planning is an important phase of an IPM program that anticipates problems rather than reacting to crises, as we have often done with conventional control approaches.

A logical planning sequence includes inventory, definition of management unit (e.g., landscape, gardens, or selected parts), establishing goals, inspection, implementation, and follow-up.

The inventory should include the location and identification of trees, shrubs, and other important plants existing and anticipated in your landscape. Age or size, state of health, and physical factors that may influence their future health or implementation of management tactics should be noted.

Definition of your management unit will require decisions that affect the amount of energy required to implement the program. You may wish to include only key trees and shrubs and turf areas in the program or go to other extreme and develop a plan for the entire property, including gardens.

My advice to beginners is to concentrate on key plants, those that provide aesthetic or functional attributes that contribute significantly to your pleasure and the value of your property. However, those who enjoy gardening may decide to include their entire property.

Next, goals of the IPM program should be defined, based on individual tolerance to pest presence and with the understanding that most insects on most trees and shrubs are not causing excessive damage. Rather than attempting to eradicate all insects and diseases from your property, you make an effort to minimize their impact with minimum maintenance. For instance, you may be willing to settle for reasonable foliage protection rather than total caterpillar mortality. Persons employing the principles of IPM will tolerate low levels of pests but will be skilled and vigilant enough to prevent build-up of damaging pest populations. Selection of pest-resistant varieties, from trees to vegetables, is obviously a good beginning.

The specialists at your cooperative extension, botanical garden or arboretum can be very helpful. You must determine which potentially damaging pests have been reported to attack trees, shrubs, turf or gardens in your area. Learn at which stage(s) they are most vulnerable to various control tactics. Become thoroughly familiar with available control methods and their costs and benefits. Evaluate them in light of your goals, and develop potential controls *before* a pest population is detected.

Inspection is the operational key to effective IPM. Landscape plants should be inspected *at least* in spring and autumn to detect pests before they cause serious damage. Vegetables, annual flowers, roses and other vulnerable plants should be inspected more frequently.

Inspection and interpretation of results are the most time-consuming and difficult aspects of IPM. Rather than spraying plants one or more times each year to prevent establishment of pests, energy is invested in scrutinizing plants to determine their relative health and to detect pest presence. Become familiar with symptoms associated with common insects and diseases. Practice builds confidence.

There are several inspection/detection techniques that will facilitate the task. A white cloth or paper placed beneath branches or leaves that are then shaken or struck to dislodge pests is helpful for sampling caterpillars, beetles and mites. Sticky traps containing insect sex attractants can be used to detect presence and define seasonal emergence of Japanese beetle adults, gypsy

moths and borers that attack lilacs, oaks, dogwoods, flowering fruits and ash trees. Pit-fall traps can be used to collect pests that crawl on the ground. Blacklights can be used to monitor moths that produce caterpillars that consume vegetables.

When pest infestation is detected, an effort must be made to determine if chemical control or improved cultural practices (pruning, watering, fertilizing, mulching, improving soil quality or aeration, etc.) of the plant or soil is warranted. This is the most subjective part of IPM. Although strict guidelines are not available, remember that if the plant appears healthy and only a small pest population is detected, treatment is probably not necessary before the next inspection. Keep notes on relative pest abundance, so you can determine if the population density is changing with or without treatment.

Implementation of control methods will follow naturally and logically and be timely if your program has been established as suggested. To minimize costs and non-target effects, apply pesticides only to plants that are significantly infested. Better cultural practices can enhance plant vigor whenever pest populations are detected. This approach is also recommended when a recently controlled pest population has reduced plant vigor.

Follow-up is an essential component of all IPM programs but is often neglected. Plants that have received a cultural or direct control treatment must be inspected to determine its effectiveness and to check on plant response. Records must be kept for future reference. This IPM tactic will permit you to update and improve the effectiveness of your program.

A Parting Thought

Treat trees and other landscape plants well in terms of preventive health care. Plant the species and varieties adaptable to the climate and the site. Fertilize, irrigate and prune properly. Healthy plants are not only more beautiful but are also less susceptible to most pests. When natural resistance breaks down and a pest population develops, familiarity with control options and their costs and impacts will facilitate pest control in an ecologically acceptable manner before

permanent damage is done to important plants.

Ed. note: The IPM concept is already widely accepted in agriculture and horticulture.

"The Avant Gardener" in a special issue devoted to IPM reports a program for homeowners in Maryland. For \$50.00, a Co-operative Extension Service IPM scout will thoroughly check a garden fifteen times during a season and give control recommendations. The homeowner receives a notebook for recording watering, spraying, etc. (See Suggested Readings.)

Other states are establishing similar programs. Check with your local extension office.

Suggested Reading

Adamchak, R., and J. Redmond, editors. "The IPM Practitioner" (issued monthly). R.D. 1, Box 28 A, Winters, CA 95694.

"The Avant Gardener," Vol. 15, No. 7, May 1983. Horticultural Data Processors, New York, N.Y. 10028. Reprints \$1.50 each.

Biological Control of Plant Pests, Plants & Gardens Handbook #34. Brooklyn Botanic Garden.

Gardening Without Pests, Plants & Gardens Handbook #89. Brooklyn Botanic Garden.

Harris, R.W., *Arboriculture: The Care of Trees, Shrubs and Vines in the Landscape.* Prentice-Hall, Inc. Englewood Cliffs, NJ 07632. *

Pesticide Pointers

Read all directions on pesticide containers. Follow them exactly.

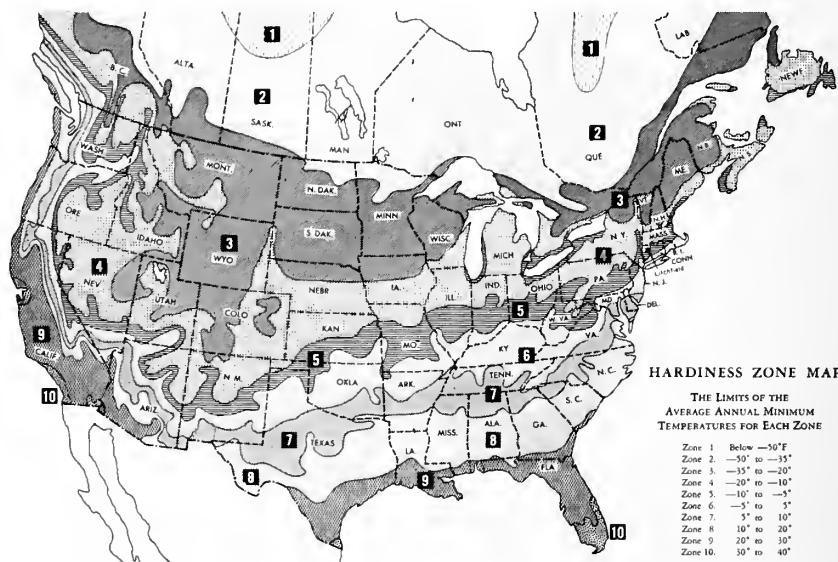
Don't buy the farm size package if you don't have a farm. Many pesticides have relatively short "shelf life."

Use the proper method and/or material, and do it at the right time. You can't kill many beetles with a fungicide, and there's little profit in spraying chewed leaves after beetles have moved on.

Mix only as much spray solution as you will use at one time. Many materials lose efficiency in solution, some in a matter of a few hours, especially when water is alkaline.

Never spray into the wind. If possible, spray when the air is still.

Dispose of unused pesticide and clean containers according to manufacturer's directions. Store remaining pesticides properly and safely. *



Compiled by The Arnold Arboretum, Harvard University



Eva Melady

AN INVITATION TO JOIN AND ENJOY

**A man does not plant a tree for himself;
he plants it for posterity.**

—Alexander Smith

ALL who read these lines and are interested in the out-of-doors and the beauty of living things are cordially invited to become Members of the Brooklyn Botanic Garden. The dues are \$15 annually. Memberships make fine gifts, too. For many, the Botanic Garden means spiritual enrichment, and they find satisfaction in contributing toward its support. Others enjoy the Membership opportunities, which include a subscription to *PLANTS & GARDENS*, occasional plant and seed "dividends," popular short courses at reduced rates and other benefits. Why not get pleasure from both?

cut off here

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- 77 NATURAL GARDENING HANDBOOK
- 89 GARDENING WITHOUT PESTS
- 34 BIOLOGICAL CONTROL OF PLANT PESTS
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- 91 ROCK GARDENING
- 84 SMALL GARDENS FOR SMALL SPACES
- 92 ROSES
- 36 TRAINED AND SCULPTURED PLANTS
- 86 GROUND COVERS AND VINES
- 74 ANNUALS
- 87 PERENNIALS AND THEIR USES
- 56 SUMMER FLOWERS FOR CONTINUING BLOOM
- 96 BULBS
- 59 FERNS

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- 13 DWARFED POTTED TREES: THE BONSAI OF JAPAN
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- 81 BONSAI FOR INDOORS
- 37 JAPANESE GARDENS AND MINIATURE LANDSCAPES

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- 22 BROAD-LEAVED EVERGREENS
- 47 DWARF CONIFERS
- 25 100 FINEST TREES AND SHRUBS

99 NURSERY SOURCE MANUAL

- 94 FLOWERING SHRUBS
- 41 FLOWERING TREES
- 67 FRUIT TREES AND SHRUBS
- 66 RHODODENDRONS AND THEIR RELATIVES
- 65 TREE AND SHRUB FORMS—THEIR LANDSCAPE USE

HERBS, VEGETABLES, ARTS, CRAFTS

- 98 HANDBOOK ON CULINARY HERBS
- 68 HERBS AND THEIR ORNAMENTAL USES
- 57 JAPANESE HERBS AND THEIR USES
- 69 THE HOME VEGETABLE GARDEN
- 80 DESIGNING WITH FLOWERS
- 76 DRIED FLOWER DESIGNS
- 46 DYE PLANTS AND DYEING
- 72 NATURAL PLANT DYEING
- 58 MINIATURE GARDENS (*sink and trough gardens*)
- 78 TERRARIUMS

INDOOR GARDENING

- 70 HOUSE PLANT PRIMER
- 90 HOUSE PLANTS
- 93 GARDENING UNDER LIGHTS
- 42 GREENHOUSE HANDBOOK FOR THE AMATEUR
- 53 AFRICAN-VIOLETS AND THEIR RELATIVES
- 81 BONSAI FOR INDOORS
- 54 ORCHIDS
- 43 SUCCULENTS

A BUNDLE OF OTHERS

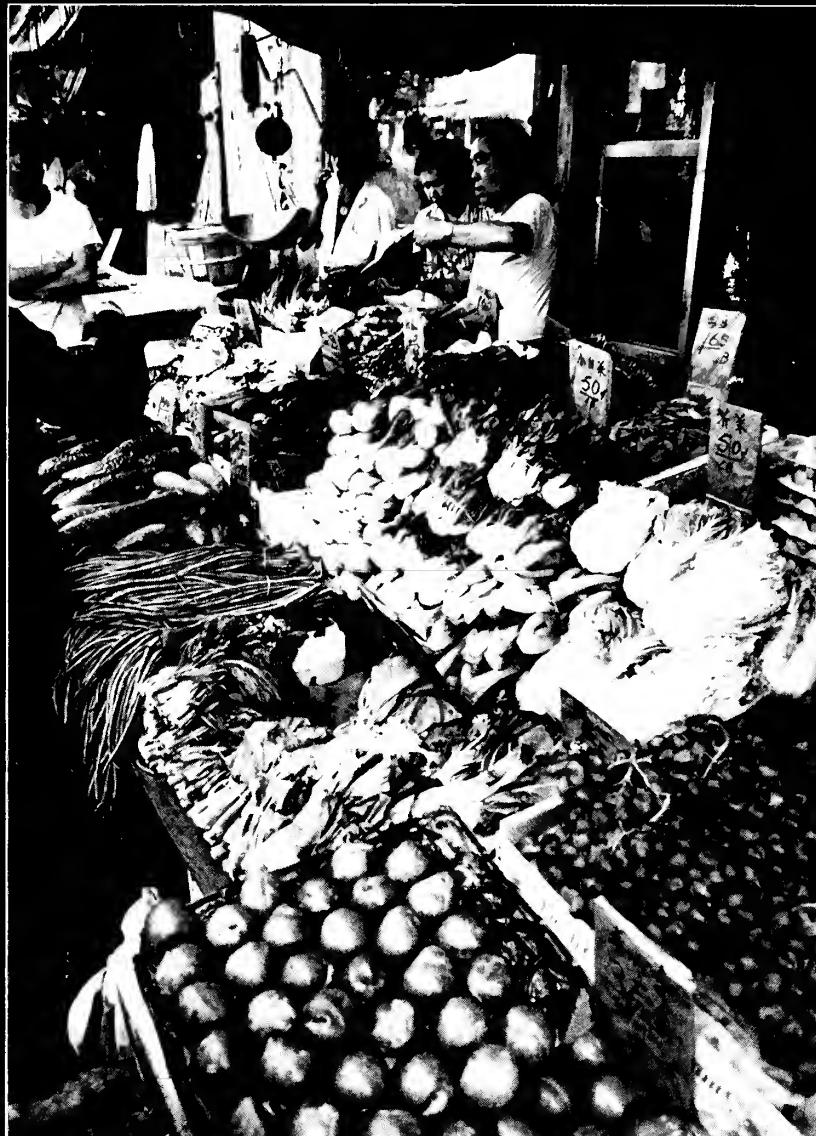
- 75 BREEDING PLANTS FOR HOME AND GARDEN
- 49 CREATIVE IDEAS IN GARDEN DESIGN
- 45 GARDEN STRUCTURES
- 82 THE ENVIRONMENT AND THE HOME GARDENER
- 88 COMMUNITY GARDENING

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CONTENTS

<i>Chinatown, New York, Vegetable Market</i>	<i>Glenn Kopp</i>	Cover
Among Our Contributors		Inside Front Cover
Frontispiece: <i>Chinese Bounty in New York</i> and key to Cover	<i>Glenn Kopp</i>	2
Letter from the Brooklyn Botanic Garden		3
Getting to Know Chinese Vegetables ... <i>Nancy and Stephen Tim with Henley Dunne</i>		4
Vegetables Used in Thai Cuisine	<i>Glenn Kopp</i>	20
Stir-Frying Oriental Vegetables	<i>Serle Ian Mosoff</i>	26
Centuries-Old Chinese Cross-Row Raised-Bed Culture of Vegetables		
 <i>Editors of Gardens For All News</i>	29
Vegetable Farming in China	<i>Ernest L. Bergman</i>	37
Backyard Water-Chestnuts	<i>James Preacher</i>	39
“Supermarket on a Stalk”	<i>Alan D. Cook</i>	42
Growing Chinese Cabbage		43
How to Grow and Cook Vegetable Spaghetti	<i>Derek Fell and Phyllis Shaudys</i>	44
My Favorite Melon	<i>F. Weldon Burge</i>	46
Japanese Herbs—A Personal View	<i>Mitsu Mizusawa</i>	48
Kyoto’s Traditional “Shichimi” Spices	<i>Kimiyoshi Fukushima</i>	50
Spices and Herbs Used in Japanese Cooking	<i>Naomi Makihara</i>	51
Herbs Used in Northern Japan	<i>Nobuhide Kato</i>	52
Japanese Herbs	<i>Osamu Suzuka</i>	53
A Brief History of Japanese Herb Gardens	<i>Haruya Shimada</i>	54
A Japanese <i>Materia Medica</i>		58
Traditional Chinese Medicine	<i>Chao Young</i>	60
A Chinese <i>Materia Medica</i>	<i>Chao Young</i>	62
A Dictionary of Oriental Herbs and Vegetables		65
Some Sources of Seeds and/or Plants		76
Additional Reading		76

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Chinese bounty in New York



Yard-long beans
Small Chinese chard
Kelsey or green plums
(*Tsing tze lei*)
Welsh onions
Luffa (Chinese "okra")
Chinese chard
Napa
Table grapes



Packaged cauliflower
Fuzzy melon
Luffa (Chinese "okra")
Ginger root
Yard-long beans
Snow peas
Chinese chives
Chinese eggplant
Yard-long beans
Bitter melon
Bottle gourd

Keys to the cover and frontispiece photos

LETTER FROM THE BROOKLYN BOTANIC GARDEN

At a recent "botanical" party in California the guests were served, among other delectable tid-bits, a green, crunchy and utterly delicious item of finger-food. Our hostess told us it was *fuki*. After consuming at least a dozen and making the same number of guesses as to its origin we gave up (but continued to eat the succulent green morsels).

Fuki is the peeled and pickled petiole of *Petasites japonicus*, the giant butterbur or colt's-foot. Our new taste-treat was but one more in a series of adventures with Oriental vegetables and herbs which can be experienced by all who visit the hundreds of Chinese, Japanese, Indian, Thai, Korean and other Oriental restaurants in this country.

Visitors to the Far East experience many strange and different food plants, and BBG tour groups have enjoyed exploring the markets where they are sold. A number of these new varieties can be bought in the Oriental greengroceries of North America, and they are appearing in an increasing number of seed catalogs, some of which have a special section for Oriental vegetables and herbs. (Note the list on p. 76 for addresses of these sources.) Many of them include recipes!

There has always been a fascination with the ancient herbal medicines of the East, many of which are still being used today. Botanic gardens in China feature many hundreds of medicinal plants, the best known of which is ginseng. On a recent visit to China the BBG tour group was amazed to find more than five hundred plants in the Medicinal Garden of the Hortus Botanicus in Nanking.

It was the late Kan Yashiroda, that remarkable Kew-trained horticulturist from Shodoshima, Japan, who first guest-edited a BBG Handbook on Japanese Herbs and Their Uses in 1968. The current Handbook should be considered an extension and update of the Yashiroda work. Interim Editor Alan D. Cook has assembled an amazing number of fine articles, as well as selecting a few from Mr. Yashiroda's Handbook. We hope this will inspire all our readers to taste, and perhaps grow, those culinary herbs and vegetables that will survive in your climate.

And do try *fuki* if you can find it!

Sincerely,

Elizabeth Schultz.

GETTING TO KNOW CHINESE VEGETABLES

Nancy and Stephen Tim
in collaboration with Henley Dunne

“Stir-fry.” “Wok.” “Bok choy.”

Today these are all familiar terms in the international jargon of food and its preparation. Until recently, vegetables and other products familiar to Orientals were known only to a few Westerners. Nowadays, these are in such great demand that many supermarkets will stock imported soy sauce side-by-side with tomato ketchup and Chinese cabbage next to cauliflower.

The Chinatown of New York City, with its narrow streets teeming with throngs of shoppers and tourists, might well be described as the Hong Kong of the Western world. Its staggering variety and volume of Oriental vegetables alone would set it apart from many other Chinatowns as being one of the best supplied outside the Orient. The produce displayed in the myriad market stalls represents not only the particular taste of many regional Chinese, but also that of neighbors, including the Thais, Filipinos, Vietnamese, Japanese, Koreans and Cambodians.

In the early dawn hours, from spring to late autumn, trucks from southern New Jersey rumble through the maze of streets bringing in crates of green vegetables. Year-round produce from farther afield, particularly Hawaii, Texas, California and Florida, adds to the variety of edibles available. Being able to

obtain snowpeas whenever the whim moves one is a rather nice luxury.

Using the great variety of produce usually seen in New York's Chinatown as a reference, a wide range of Chinese vegetables (“vegetables” is used in the broadest sense) will be described and their main uses outlined.

To establish some order in such a random assortment of produce, a number of categories have been created, based primarily on the particular part used as food. These are:

Leafy cabbages or brassicas.

Other leafy greens.

Roots and stems.

Fruits and seeds. (*Fruit* is used in the botanical sense, namely a fertilized and ripened ovary containing one or more seeds.)

Chinese culinary herbs.

Fungi. These are included because of their importance in Chinese cuisine.

LEAFY CABBAGES OR BRASSICAS

Chinese mustard greens

Brassica juncea
Gai choy



The squat, robust nature of this vegetable with its curved leaves makes it easy to recognize.

Uses: It is commonly pickled but can be stir-fried.



Chinese chard cabbage

Brassica rapa

Chinensis Gp. (Group)

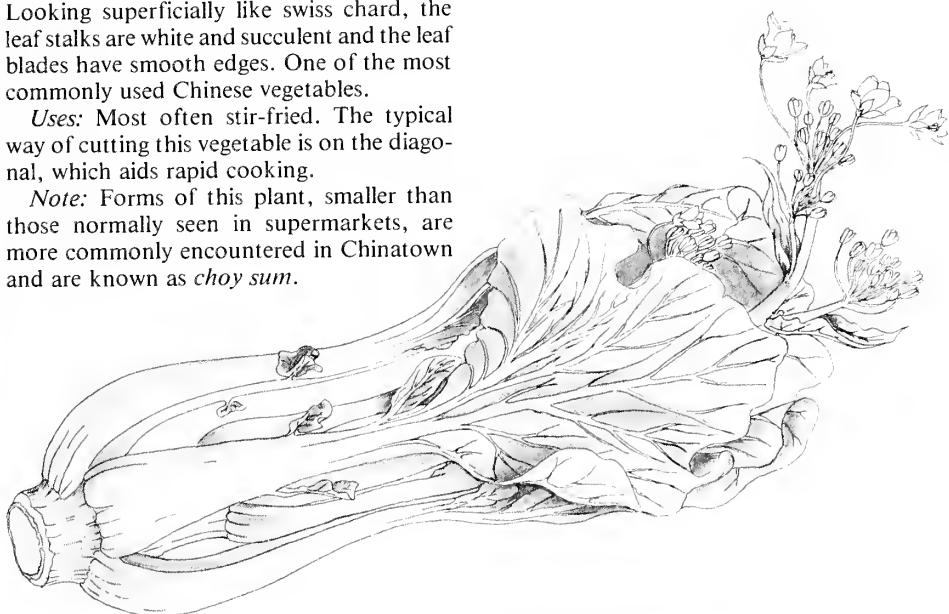
Bok choy, pak choy

白 菜

Looking superficially like swiss chard, the leaf stalks are white and succulent and the leaf blades have smooth edges. One of the most commonly used Chinese vegetables.

Uses: Most often stir-fried. The typical way of cutting this vegetable is on the diagonal, which aids rapid cooking.

Note: Forms of this plant, smaller than those normally seen in supermarkets, are more commonly encountered in Chinatown and are known as *choy sum*.



Chinese or napa cabbage

Brassica rapa

Pekinensis Gp.

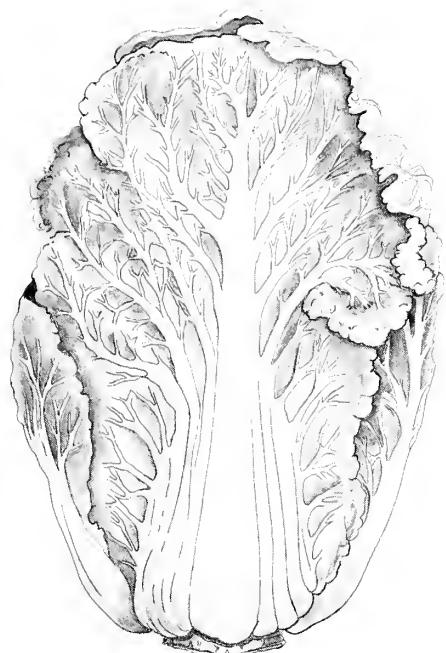
Siew choy,
wong nga bok

绍 菜

The fleshy overlapping leaves of this vegetable form a tight head. Leaves are yellowish-green and their stalks white.

Uses: The head is best split in half lengthwise and each half cut across in two-inch slices. The tender tips can be eaten raw in salads. Excellent as a cooked vegetable and has a naturally sweet taste. Use in stir-fries or add to soup.

Note: The equally compact, but narrower and longer form is known as *pe-tsai*.



Chinese broccoli or kale

Brassica oleracea

Alboglabra Gp.

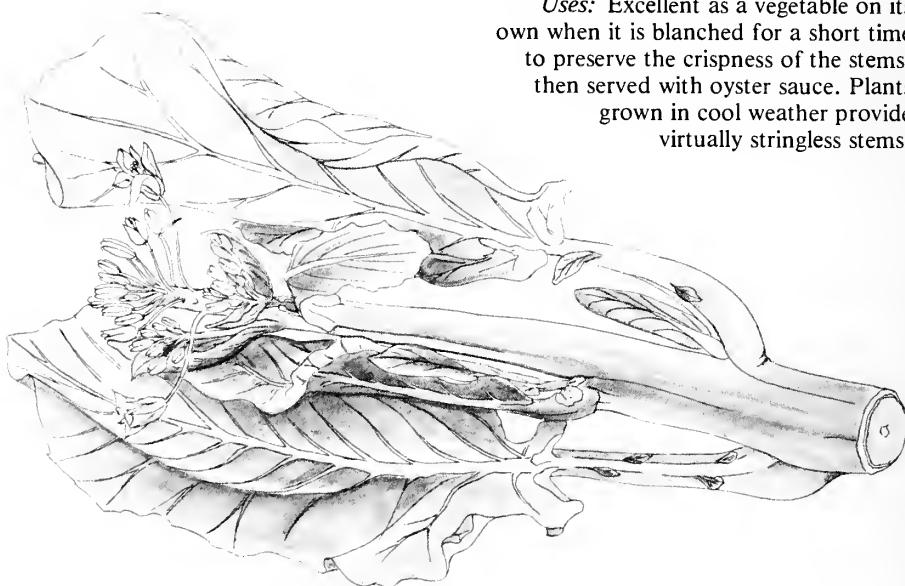
Gai lan

芥

蘭

The prominent green stems and leaves set this vegetable apart from bok choy. The flower head is never as compact as regular broccoli and individual flowers are white.

Uses: Excellent as a vegetable on its own when it is blanched for a short time to preserve the crispness of the stems, then served with oyster sauce. Plants grown in cool weather provide virtually stringless stems.



OTHER LEAFY GREENS

Chinese spinach, tampala

Amaranthus tricolor

Yien choy

苋 菜

This is an annual herb with leaves often blotched with red. It is sold in large bunches and is best when harvested young. Must be washed well as it is often sandy.

Uses: Stir-fried as a vegetable or added to soups.



ROOTS AND STEMS

Bamboo shoots

Bambusa spp. and
Phyllostachys spp.

Juk suhn

These are the tender shoots which push through the soil early in the spring. They are boiled in a number of changes of water to remove any acridity in their flavor. Fresh shoots can be found in the larger markets, otherwise they are purchased in cans.

Uses: They impart a crunchy texture to stir-fries; slices are also added to soups.

竹 筍



Kohlrabi

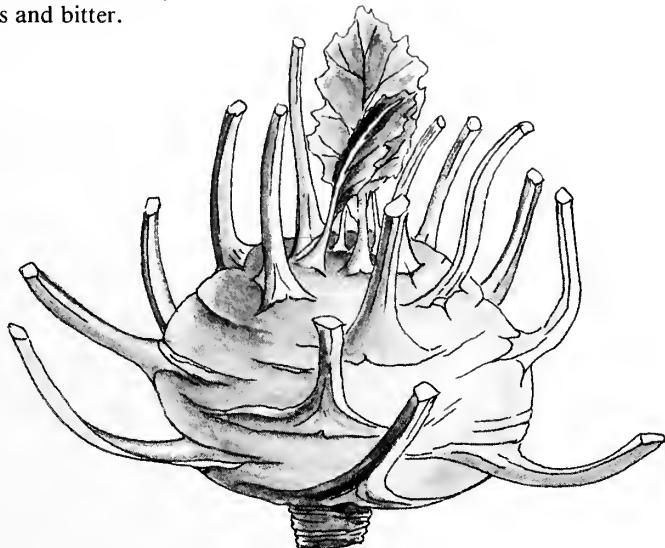
Brassica oleracea
Gongylodes Gp.

Tjin choy tow

Its unusual appearance gives little hint that it is related to the cabbages. The part eaten is the swollen stem which grows above ground.

Uses: Thin slices are added to stir-fries or soups. Old stems should be avoided as they can be unpleasantly fibrous and bitter.

青 菜 頭



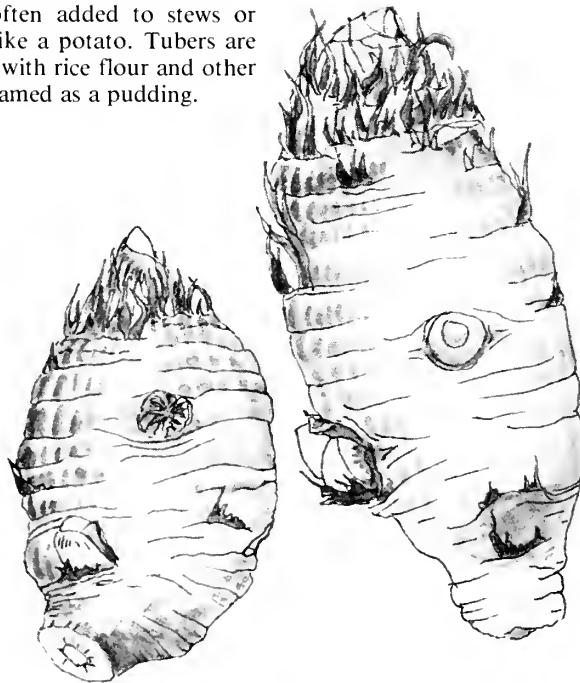
Taro*Colocasia esculenta*

Wu tow

芋頭

The tubers, covered by fibrous leaf bases, contain a very fine-grained starch which, on cooking, becomes glutinous in texture.

Uses: Taro is often added to stews or boiled and eaten like a potato. Tubers are also grated, mixed with rice flour and other ingredients and steamed as a pudding.

**Chinese water-chestnut***Eleocharis dulcis*

Mah tai

馬蹄

These are the swollen stem bases, or corms, which grow in mud. Their crisp texture and nutty flavor make them a most delectable addition to any dish where texture is important.

Uses: They must be peeled before use. Raw slices add distinction to a salad, or they can be included in any stir-fry. Cooking time is minimal.

Water convolvulus*Ipomoea aquatica*

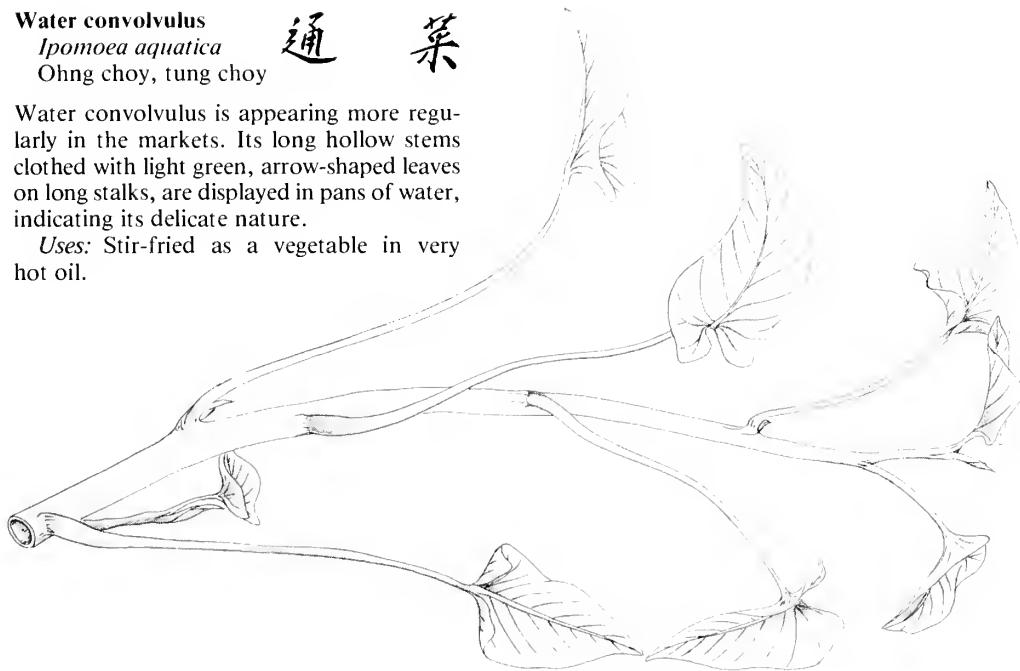
通

菜

Ohng choy, tung choy

Water convolvulus is appearing more regularly in the markets. Its long hollow stems clothed with light green, arrow-shaped leaves on long stalks, are displayed in pans of water, indicating its delicate nature.

Uses: Stir-fried as a vegetable in very hot oil.

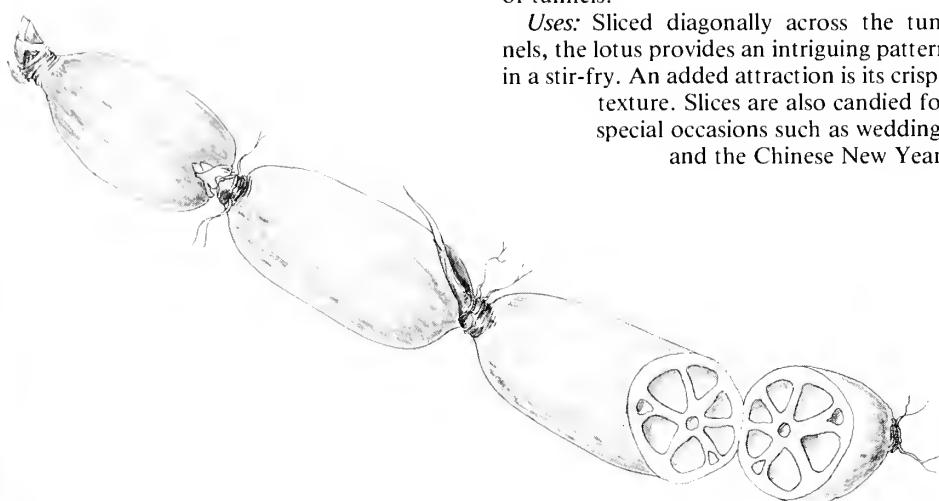
**Lotus “root”***Nelumbo nucifera*

Lien ngau

蓮 藕

The “roots” are really swollen stems which grow in the mud. They resemble huge sausage links, reddish-brown in color, and are perforated along their length by a number of tunnels.

Uses: Sliced diagonally across the tunnels, the lotus provides an intriguing pattern in a stir-fry. An added attraction is its crispy texture. Slices are also candied for special occasions such as weddings and the Chinese New Year.

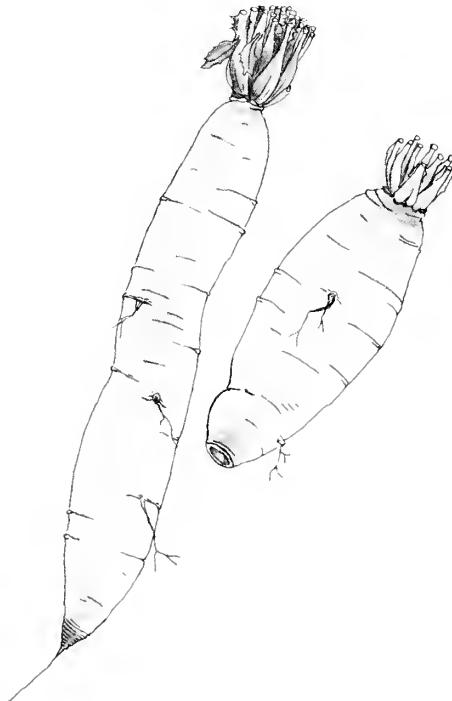
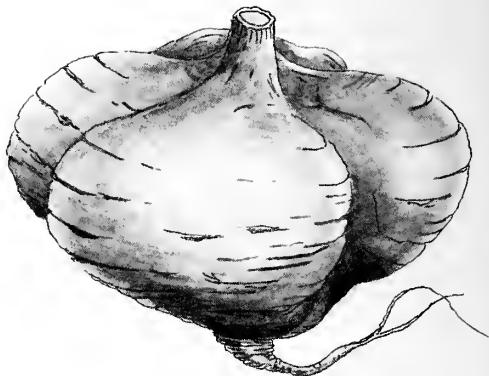


Yam bean, jicama
Pachyrhizus erosus
Sa got

沙 葛

Although native to the American tropics, this plant is grown widely in southeastern Asia. The characteristic tuber is somewhat flattened and has prominent bulges.

Uses: After peeling, the sweet, crisp flesh is eaten raw as a substitute for the water chestnut. Slices or cubes are also added to stir-fries.



Chinese radish
Raphanus sativus
'Longipinnatus'
Loh bok

蘿 蔔

This is often referred to incorrectly as a turnip. The taproot is white and specimens a foot long are often seen.

Uses: After cleaning with a stiff brush, can be eaten raw; most often pickled. Chunks are added to stir-fries or slices to soups. It can also be grated and steamed as a pudding.

Arrowhead, swamp potato
Sagittaria sagittifolia
Chee koo

慈 姑

In the Orient, this plant is cultivated in the rice paddies. The corm or swollen stem base is the part eaten by Orientals. The flesh is starchy and has a distinctive flavor.

Uses: Added to stews or boiled and eaten as one would a potato.



FRUITS AND SEEDS

Winter melon, wax gourd

Benincasa hispida

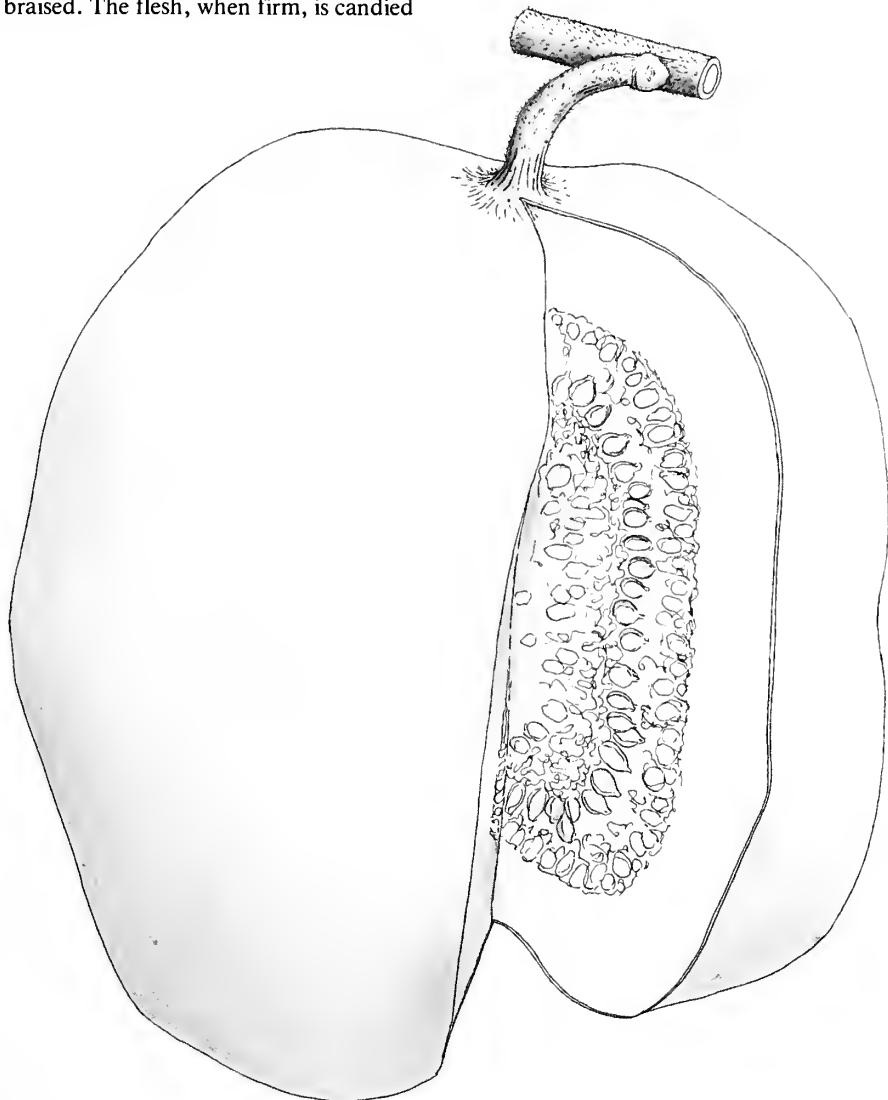
Doong gwa

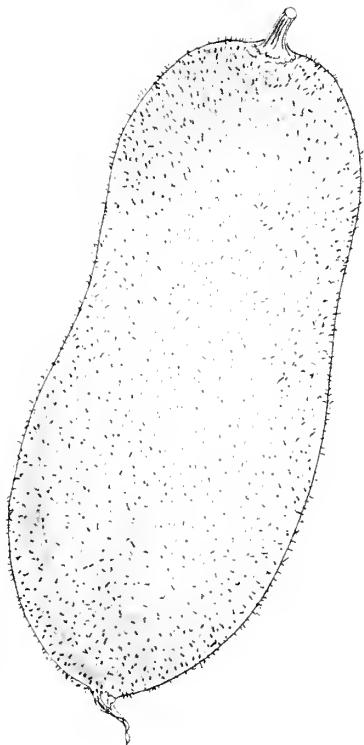


This is a large-growing melon which can reach twenty-five pounds or more. At maturity, the skin is covered with a powdery white wax which protects the melon from drying out. When hung, supported in an open-weave sack in a cool place, these melons can be stored for a number of months.

Uses: Slices are cooked in soup, chunks are braised. The flesh, when firm, is candied

or pickled. For special occasions, an elaborate dish called winter melon pond or *doong gwa choong* is prepared. This involves a hollowed winter melon filled with an impressive array of delectable items, then steamed.





Fuzzy melon

Benincasa hispida

variety

Jiet gwa

節

瓜

Some of these melons are short and rounded, others longer and cylindrical. Their surface is covered with fairly stiff hairs, hence "fuzzy."

Uses: After peeling, hollowed sections can be stuffed and steamed or braised. Thin slices are also added to soups.

Chinese "okra"

Luffa acutangula

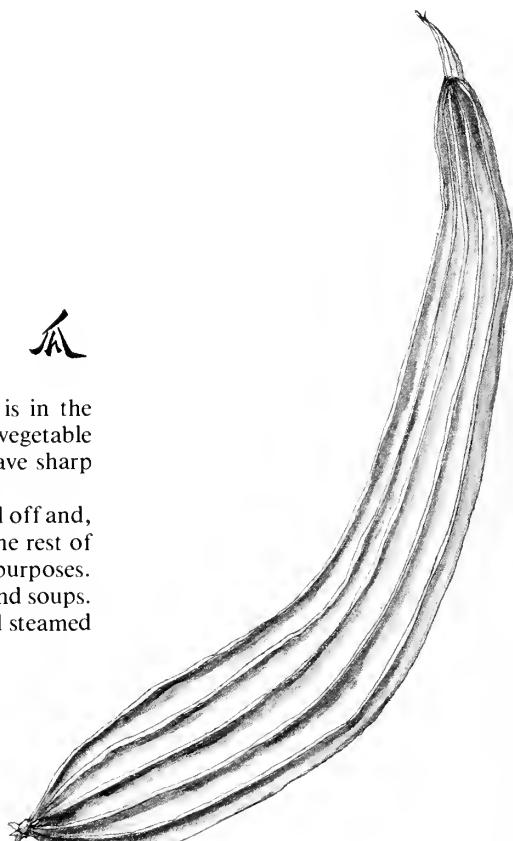
Cee gwa, sing gwa

絲

瓜

This plant is not an okra, which is in the genus *Hibiscus*, but is one of the vegetable sponges. The club-shaped fruits have sharp ridges running along their length.

Uses: The ridges should be pared off and, in the case of the younger fruits, the rest of the skin left intact for decorative purposes. Slices blend well in quick stir-fries and soups. Thick slices can also be stuffed and steamed or deep fried.



Bitter melon

Momordica charantia

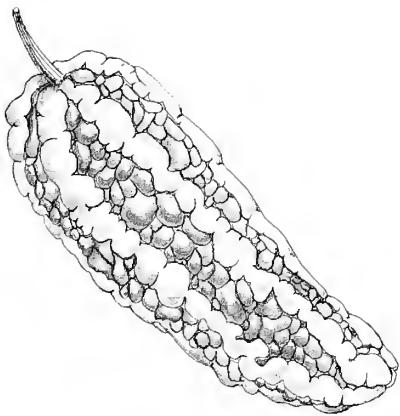
苦

瓜

Foo gwa

The fruit of bitter melon is covered with rounded bumps and ridges. It changes from a medium green color when young to a yellowish green when mature. Due to its content of quinine the taste is markedly bitter. Some find this cooling and appealing, others consider it too exotic.

Uses: The fruits are not pared. Seeds and pulp must be removed before being used. Slices can be stir-fried or halves stuffed and steamed.



Lotus seeds

Nelumbo nucifera

Lien chee

蓮子

The seeds, from the large seed pods of the spectacular lotus lily, are sold dried in packets. If the brown skins are still attached, these can be removed after steeping in boiling water for a short time. The bitter embryo is usually removed.

Uses: The seeds are added to a variety of dishes requiring longish cooking, such as stews. They are also candied for special festivals.

Snow peas

Pisum sativum

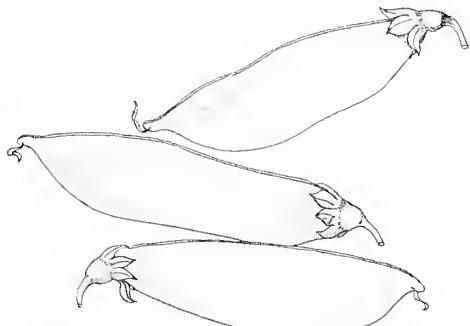
var. *macrocarpon*

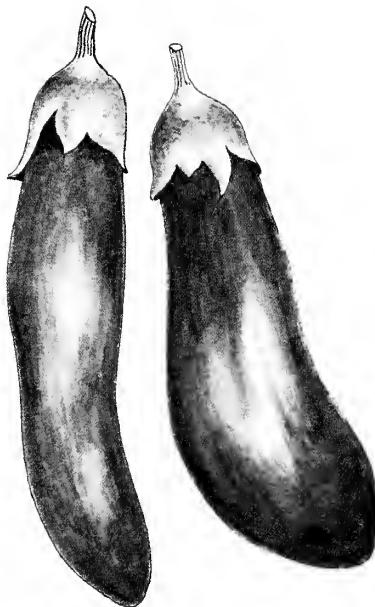
Ho lan dow

荷蘭豆

The whole pod is edible, the texture is crunchy and the flavor sweet.

Uses: These require very little cooking and are added to stir-fries during the last ten seconds before serving. They are also most welcome in raw salads or in a vegetable dip. Leave them whole unless they are overly large.





Chinese eggplant

Solanum melongena

var. *esculentum*

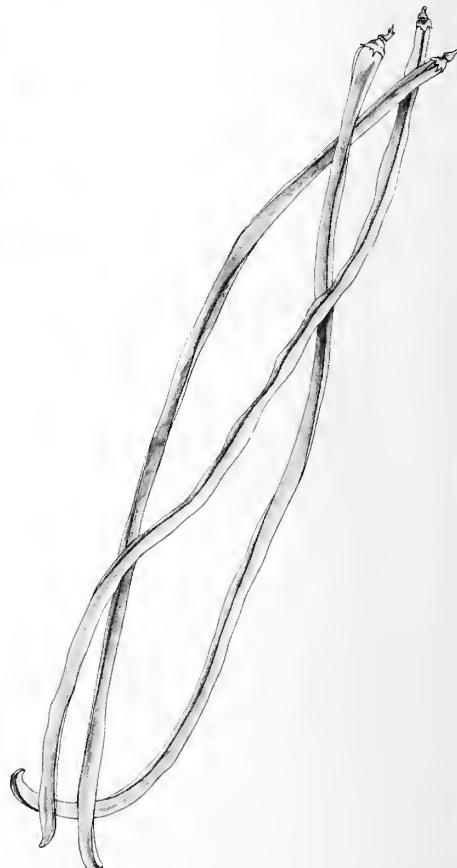
Ai gwa

矮

瓜

The eggplant favored by Orientals is narrower and longer than the larger oval form more commonly seen in the West. In color, it varies from a glossy dark purple to a creamy white.

Uses: These eggplants are not skinned before cooking. Slices can be stir-fried or chunks braised with meat. They are also fine stuffed and steamed or deep fried.



Yard-long beans

Vigna unguiculata
subsp. *sesqui-*
pedalis

Dow gauk

豆 角

While the name is an exaggeration and pods don't achieve three feet in length they are long enough to use when twelve to sixteen inches.

Uses: Use as ordinary green beans. Slice diagonally and stir-fry.

Mungbean sprouts

(Not illustrated)

Vigna radiata

Nga choy

芽 菜

A number of bean seeds can be used but the commercially available sprouts are usually

from mung beans. These are sprouted in the dark under moist conditions and are creamy white in color.

Uses: Can be eaten fresh in salads or added to any stir-fry.

CHINESE CULINARY HERBS

The word "herb" is used in its broadest sense. This section includes plants and seeds used for imparting distinctive flavors to dishes. Some are also considered to have medicinal qualities.



Chinese chives

Allium odorum

Gow choy

薑 茄

Individual chives are very thin and are sold in large bunches without the bulbs.

Uses: The bunches are cut into 2" lengths and stir-fried. Overcooking results in a loss of the strong fragrance that makes these chives sought after.

Garlic

(Not illustrated)

Allium sativum

Suhn

蒜

Garlic has been known in China since ancient times and is thought to have been introduced from western Asia.

Uses: It is freely used in many dishes and is a very important item in Chinese cooking. Many marinades will include garlic.

Chinese parsley, coriander

Coriandrum sativum

Yuen sai

芫 茜

The fine-textured leaves are most aromatic, although some find this fragrance too alien.

Uses: The pretty leaves are often used as a garnish. Coarsely chopped leaves provide a distinctive tang to various dishes and are especially fine with poached fish.



Ginkgo nuts

Ginkgo biloba

Bak gwo

白 果

The fruits of the female tree ripen in the autumn when their presence is made obvious by the evil-scented fleshy coat around the seeds. The seeds with the fleshy coat removed are sold loose or in packets. Shells must be carefully cracked and the skins around the seeds can be removed after steeping in boiling water.

Uses: The seeds are cooked in soups, stews or vegetarian dishes.

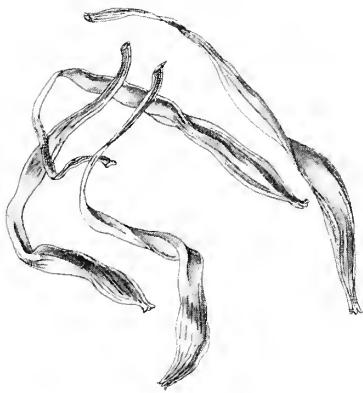
Daylily buds, golden needles

Hemerocallis fulva
and other species
Gum chum

金針

The lily buds are sold in bronze-colored clumps. These are soaked in water overnight or in a pan of hot water, covered but removed from the flame, until soft. The hard end is cut away.

Uses: These are added whole or halved to stir-fries. The delicate flavor with its hint of asparagus can best be appreciated when the buds are steamed with chicken. To prevent the buds from unfurling during cooking, knot them in the center after soaking.



Watercress

Nasturtium officinale
Sai yeung choy

西洋菜

Although native to Europe, watercress has been adopted by the Chinese. It features prominently in Chinese cooking and is thought to impart a "cooling" effect on the body. In his herbal of 1597, John Gerard reported the plant's healthful reputation when boiled "in the broth of flesh."

Uses: Raw cress is welcome in fresh salads but the Chinese will always eat it cooked. It is stir-fried or added to broth.



Ginger

Zingiber officinale
Geung

薑

This is often referred to as the ginger "root," but the part used is the underground stem or rhizome. Only the fresh form is used.

Uses: After peeling, slices can be added to flavor soups or stews. The Chinese seldom stir-fry vegetables without first browning a piece of ginger in the hot oil. This is done to balance the "cooling" effect of the vegetables with the "warming" attributes of the ginger. Young ginger is pickled or candied.

FUNGI

A number of fungi are commonly used in cooking. The more popular ones are dealt with below.

Black fungi

Two types:

Cloud ears

Auricularia polytricha

Wan yee

雲耳



Wood ears

Auricularia sp.

Mok yee

木耳

Of the two, cloud ears are the smaller form and are the more popular in cooking (the wood ears are much coarser). Both are bracket or shelf fungi, growing on decaying logs in the forest. They are sold dried and when reconstituted by soaking in water swell to about three times their dried size. Wash well after soaking and cut away the short stalk.

Uses: Both are sliced or cut into coarse segments and added to stir-fries or steamed with meat.

Chinese mushrooms

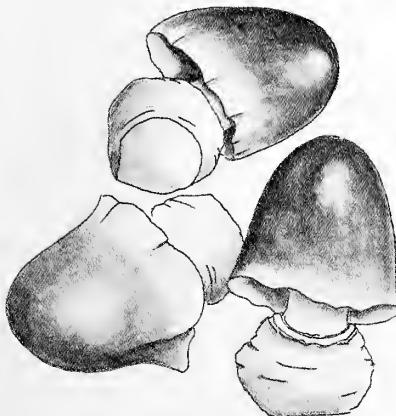
Lentinus edodes

Doong gwooh

茶 茄

These are sold dried and come in a number of grades. They are soaked in water overnight or can be rapidly reconstituted by steeping, covered, in a pot of boiling water which has been removed from the burner. Remove the stalks before using.

Uses: Whole caps can be cooked in soups, providing a most delightful mushroom flavor to the dish. However, they are more often sliced thinly and added to stir-fries or steamed with meat.



Straw mushrooms

Volvariella volvacea

Cho koo

草 茄

Canned forms of this fungus are preferred to the dried, which have to be soaked.

Uses: Add to stir-fries, whole or halved. They are always interestingly flavorful and juicy.



VEGETABLES USED IN THAI CUISINE

Glenn Kopp

The cuisine of Thailand is rich and varied, encompassing mild flavored Chinese dishes, rich Indian dishes and, of course, original Thai dishes that are generally full-flavored, hot and spicy. With such great diversity and Thais' readiness to adapt new herbs and vegetables into their cuisine, the range of materials used is quite extensive. Many are identical to those employed by the Chinese, but others can be very local and hard to find outside of Thailand.

Since the Chinese vegetables described on pp. 4-20 (with the exception of ginkgo nuts and watercress) are also widely used in much the same ways in Thailand, I shall not repeat them. It should be noted, though, that, unlike the Chinese, Thais eat a number of vegetables raw. For example, Chinese cabbage and yard-long beans are eaten raw as well as cooked. Leaf lettuce, cabbage and cucumbers, less commonly used in Chinese cuisine, also are eaten raw.

One additional note should be made. In the recent past an explosion of "new" vegetables including sweet corn, asparagus, cauliflower,

broccoli, carrots, head lettuce, tomatoes, green peppers and potatoes are making, or have made, their way onto Thai floors (Thais often eat on mats on the floor). Other vegetables commonly used are green onions, winter onions, snap beans, soybeans, peanuts, pumpkins, yams (*Dioscorea alata*, *D. esculenta*) and sweet potatoes (*Ipomoea batatas*). In addition to this host of vegetables, there are some vegetables or ingredients that are unique or indispensable to Thai cuisine. Those that are most readily available in Western markets are described below.

Siamese ginger, laos, galanga

Alpinia galanga

Ka

Light-yellowish rhizome with pinkish shoots, larger than the Chinese ginger which is also used. Available sliced and dried, powdered and occasionally fresh.

Uses: Used to flavor soups and curry pastes. Distinctive although similar in flavor to Chinese ginger. One classic soup combines chicken, coconut milk, Siamese ginger, fish sauce and lime juice.



All photos by Glenn Kopp

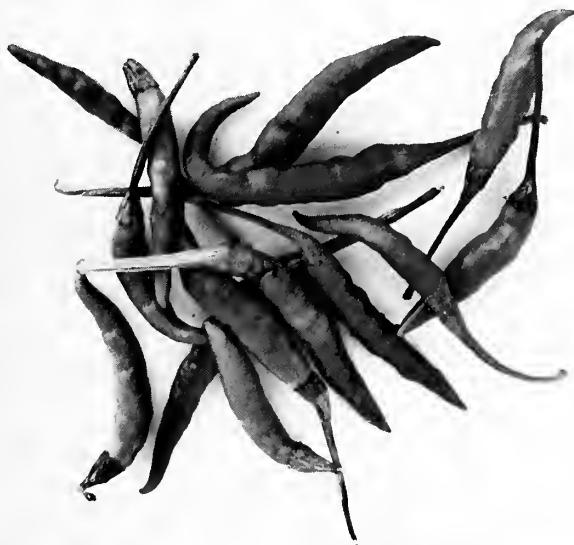
Hot peppers

Capsicum frutescens

Prik

Fruit slender, ranging from $\frac{3}{4}$ –4" in length. Generally the smaller they are, the hotter they are. Color ranges from green to orange to red. All are native to the New World.

Uses: Used fresh in salads, cooked in curries, soups and stir-fried dishes. Can also be used when dried. Ground dried hot pepper is even mixed with salt or sugar and eaten with fruit.



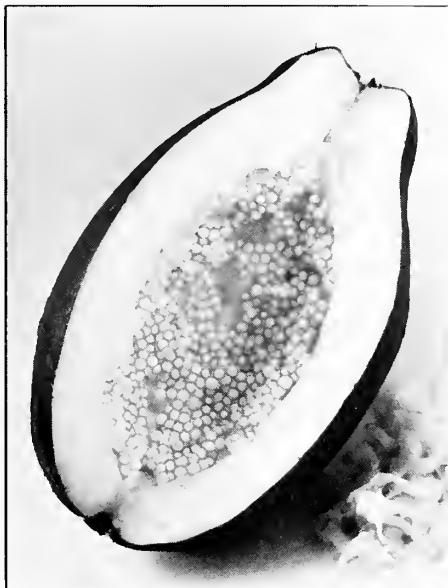
Papaya

Carica papaya

Malakor

Melon-shaped fruit ranging from 6"–20" in length. Center is hollow and usually covered with black seeds (when ripe) or white seeds (when immature).

Uses: When ripe, as a fruit. When immature (green), peeled and cooked as a vegetable in soups or shredded raw and combined with hot peppers, garlic, fish sauce, lime juice and any number of other ingredients to form a classic salad.



Kaffir-lime

Citrus hystrix

Makrut

Leaves are $1\frac{1}{2}$ "–3" in length and have a distinctive citrus aroma. Fruits are $1\frac{1}{2}$ "–2" in diameter, round and very warty in appearance.

Only the leaves and rind are used, the juice of the fruit is not. Leaves are available fresh or dried; rind, dried only.

Uses: Leaves are added to soups and curries to impart a pleasant citrus flavor. The rind is used in curry pastes.



Coconut milk

Cocos nucifera

Nam katee

Coconut milk is made by grating the flesh of the coconut, mixing it with warm water and extracting the oil by squeezing through a cloth. The pulp remaining after extraction is discarded. Canned unsweetened coconut milk is also available. The cloudy liquid inside the coconut commonly called "milk" is more appropriately referred to as juice. It is used as a refreshing beverage.

Uses: Coconut milk is used extensively in curries, desserts and sweets. Makes a delicious egg custard.



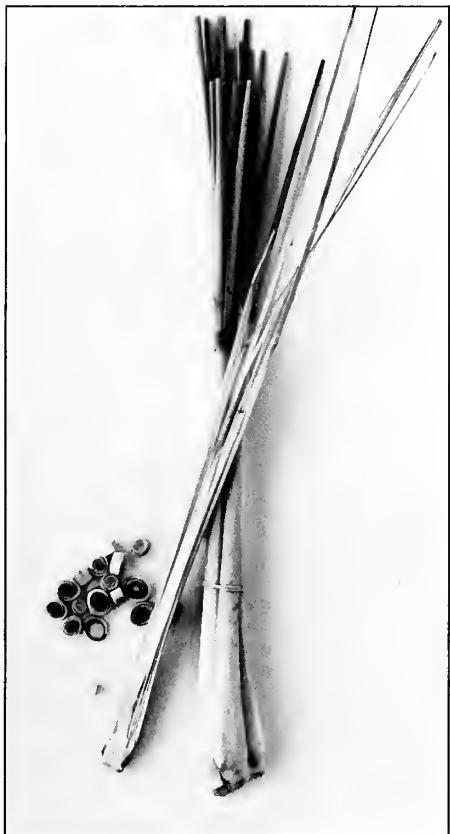
Lemon grass

Cymbopogon citratus

Takrai

A perennial lemon-scented grass that grows in clumps. Stalks are 18"-24" in length, grayish-green and slightly enlarged at the base. Also available dried and powdered.

Uses: Imparts a lemony flavor to soups, salads and curries. Has a particular affinity with fish and seafood dishes.



Convolvulus, water spinach

Ipomoea aquatica

Pak boong

Annual prostrate vine of the Morning-glory Family with crisp, hollow stems. Shoots 10"-12" long with narrow arrow-shaped leaves. Sold in bunches.

Uses: Most popularly stir-fried with garlic and a fermented bean sauce in a flaming wok. Also added to soups or eaten raw.



Holy basil

Ocimum sanctum

Bai grapao

Shrubby small-leaved basil with dark green leaves, marked with purple; strong scented. Flowers pink or light purple. Available dried and occasionally fresh.

Uses: Stir-fried with hot peppers and chicken, pork or beef.

Note: Sweet basil (*O. basilicum* and *O. canum*) are also used fresh on raw vegetable platters or in curries.



Eggplant

Solanum xanthocarpum

Makeua praw

Fruit round, 1"-2" in diameter, light green, heavily marked with dark green, especially on the top. Fruit is hard and filled with many seeds. Eaten green (immature) before the seeds mature and become tough. Slightly bitter.

Uses: Eaten raw, steamed with dips, or cooked in curries.



Tamarind

Tamarindus indica

Mak kam

The dark sticky pulp surrounding the seeds of the tamarind fruit is purchased in packages. The pulp is mixed with warm water, squeezed and the liquid retained. The extracted pulp is discarded.

Uses: The liquid is used as a souring agent in many dishes. [Lime (*Citrus aurantifolia*), is also used extensively. Lemon is not popular.]



Curry pastes

Krung gaeng, nam prik gaeng

Curry pastes are smooth, moist mixtures of several ingredients, ground in a mortar and pestle, which, with coconut milk, form the base of most curries. Standard ingredients include hot peppers (fresh, roasted or dried), shallots, garlic and a combination of any number of other ingredients, several of which have been noted earlier. In addition to these, cumin seed, coriander seed and roots and black pepper are often added. Curries of Indian origin usually include mixtures of cardamom, cinnamon, cloves, nutmeg or turmeric. The exact combination depends upon

the kind of curry and the preference of the cook. Curry pastes can be made from scratch, using a mortar and pestle, or purchased canned, bottled or packaged.

Fish sauce

Nam pla

Fish sauce, a brownish-colored brine made from fermented fish or shrimp, is so indispensable to Thai cooking that it bears mentioning. Because of its inherent saltiness it all but eliminates the use of additional salt in cooking. It is used in most dishes with the exception of desserts and sweets. 

STIR-FRYING ORIENTAL VEGETABLES

Serle Ian Mosoff

Oriental vegetables may be cooked in the same manner as any others, or eaten raw, for that matter. Somehow, though, they seem to taste best when cooked in the ancient manner, quickly in hot oil in a wok.

The classic wok is made from iron and needs to be seasoned before its first use. More common today is the rolled steel wok, which also needs seasoning. Seasoning consists of washing the new wok in soapy water to remove the film of oil applied at the factory, heating the wok to dry and warm it and, when it is dry and quite warm, rubbing it with a paper towel that has been dipped in vegetable oil. Any mild oil may be used—peanut or corn oil will do quite nicely. (Avoid strongly flavored oils such as olive oil.) As the wok is used it will slowly turn black. This blackening with use is like the patina on antique furniture or a well-smoked meerschaum pipe and demonstrates that the cook is an experienced “wokker.”

A wok is just a round-bottomed, high-sided frying pan, so it is not essential to have one to stir-fry. Any large saucepan or frying pan will do almost as well. A saucepan with sloping sides is best since you’ll be doing a great deal of tossing and shoving about of the contents.

The curved shape of the wok is probably the most efficient ever devised for the transfer of heat from a fire to the food being cooked. One writer suggests that the wok was first used for stir-frying by Chinese agricultural laborers who lived in huts in the fields throughout the growing season and who needed a way of cooking their food while using a minimal amount of scarce fuel.

The efficiency of the shape of the wok is matched by the efficiency of stir-frying as a method of cooking. It is fast, it uses little oil, it does not destroy vitamins, it saves juices by searing and sealing the outer surfaces of the vegetables.

Most woks are purchased with an aluminum lid, useful for steaming and braising, and a round-bottomed metal ladle which is

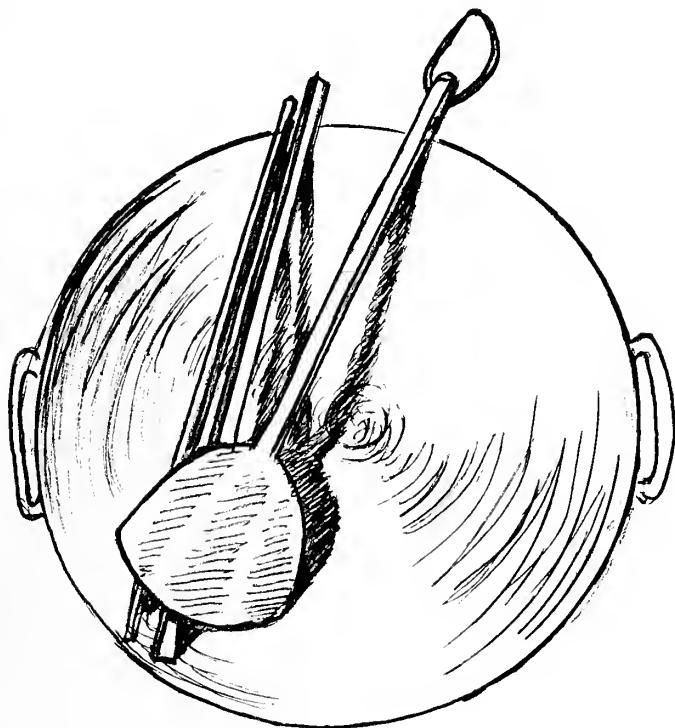
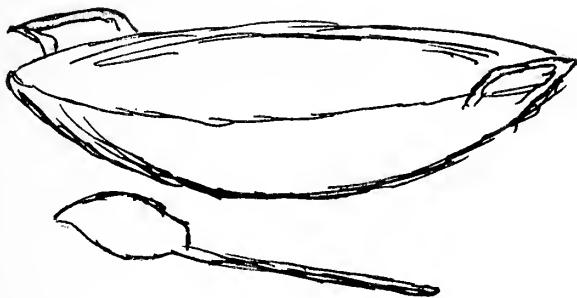
uncommonly efficient to use. The wok also comes with a ring. For gas ranges, the wok is placed on the ring over the flame and the flame adjusted. But the wok and ring system doesn’t work on an electric range. Unless the wok sits directly on the heating element, the wok doesn’t get hot enough for stir-frying. If you have an electric range, the best bet is to buy a wok with a flattened (note: flattened, not flat) bottom that is sufficiently stable to sit directly on the burner element without tipping over. Test it in the store on the counter and don’t buy it if it isn’t reasonably stable.

The standard sized wok is fourteen inches in diameter across the top. Both twelve inch and sixteen inch sizes are sold and are useful for cooking for two persons or for six or more, respectively. Because of the way it’s shaped you can always cook small amounts in a wok of any size, but you cannot overload a small wok and expect good results because the essence of the method is quickness.

Vegetable and Sauce Preparation

The stir-frying process begins long before the stove is turned on. One key to success is the proper cutting of the vegetables. All stir-fried vegetables are cut into small pieces. Historically this was done to save fuel because small pieces cook more quickly, and today so that all the pieces will be cooked through at the same time and because it is esthetically more pleasing. Let your imagination run free when you are cutting—square and rectangular shapes are fine but also try other shapes—matchsticks, slivers, circles, roll-cuts. The vegetables should be in pieces one inch or smaller. The smaller, the more quickly cooked; just make sure they are all roughly the same size.

Next comes the sauce preparation. Do this before cooking starts and set aside for use at the appropriate time, just before the vegetables are finished cooking. Although ingredients of the sauce can vary considerably, essentially they are a thickening agent such as



S.I. Mosoff

lotus root, arrowroot or cornstarch, with water or broth to dissolve and soy sauce for flavor. A basic sauce for stir-fried vegetables is as follows: for each pound of cut vegetables dissolve 1 tablespoon of cornstarch in

$\frac{1}{2}$ cup water or chicken broth. Add 2 tablespoons soy sauce. Mix. Set aside. Just prior to using, stir again. Add thirty seconds before vegetables finish cooking. Continue stirring until the sauce thickens.

Putting Them All Together

Heat the empty wok for thirty to sixty seconds until it is too hot to touch. Add 1 to 2 tablespoons of mild vegetable oil. Swirl the oil around to coat the wok. Add the vegetables immediately. If you are using a timer, start it. Using your ladle, continuously stir and toss the vegetables, taking care to coat them with the oil. Reduce the heat a bit if the oil begins to smoke. When the cooking period is almost up, pour in the sauce and continue to stir gently. When the sauce thickens, remove from the heat and transfer to a heated serving dish. Serve immediately.

You will find that some fibrous or dense vegetables such as broccoli stems, eggplant or root crops are better prepared by a combination of stir-frying and braising. The only difference between the standard stir-fry technique and braising is that for braising, the vegetables are stir-fried in the usual manner then 1 to 2 tablespoons of water are added to the wok, which is then covered and the vegetables are quickly braised. It is not essential to follow the combination of stir-fry/braise procedure but the straight stir-fry method runs the risk of singeing the vegetables if they are not cooked through once the oil has been absorbed.

How Long?

In the following list of cooking times the first number is the stir-fry time and the second number, if any, is the braise time.

Bamboo shoots	3 minutes
Beans	2 minutes
Bean sprouts	1 minute
Broccoli	2 minutes/4 minutes
Chinese broccoli	2 minutes
Chinese cabbage	4 minutes
Eggplant	2 minutes/4 minutes
Greens (incl. amaranth, mustard greens, <i>mizuna, kai</i> <i>choi</i> , etc.)	1-2 minutes
Mushrooms	2 minutes
Peppers	2 minutes
Snow peas	2 minutes
Turnips	2 minutes/4 minutes
Water chestnut	1-2 minutes

As you continue to use your wok you will find that you can dispense with your timer

and determine the appropriate cooking time by the look and feel of the vegetables.

The easiest way to learn the fundamentals of stir-frying is to start with vegetables, (one of the oriental greens, for example), that don't need braising. Then try Chinese cabbage, either napa or bok choi (trim away the green part, reserving it for soup). Chinese cabbage always seems to take longer than specified, and then can end up soggy, so be careful. Broccoli is excellent once you've tried the easier vegetables, but it takes a longer time to cook and will singe at the edges if not constantly stirred. Chinese broccoli (gai lohn) is smaller, softer and easier to stir-fry. Turnips, the small round Asian kind like Tokyo Cross or Express White, quartered with their skins on and then stir-fried golden brown, turn sweet as sugar.

Seasonings

Once the basic stir-fry technique is mastered, it is time to experiment with seasonings. There are two types: those that are added to the wok and stir-fried with the vegetables and those that are added at the end of the cooking process. The first type includes garlic and ginger; either one or both are minced and added to the stir-fry oil before the vegetables go in. Another common addition is bunching onion, trimmed and cut into two-inch lengths. Those seasonings that are added at the end of the cooking process include those that are added to the sauce and those that are added to the wok at the very end of cooking. Those that are added to the sauce include chives and Chinese chives (nira). Those that are added after the sauce thickens and just before serving include oyster sauce (the classic accompaniment to broccoli) and sesame oil. Oyster sauce is a bottled sauce, dark brown in color, made from oysters, clams, soy sauce and a thickening agent. It can be purchased at Oriental groceries or specialty shops. Sesame oil is used for its aroma and is generally used for mixed vegetable dishes which have no aroma of their own. Use imported sesame oil, because the domestic product can be over-refined with little aroma.

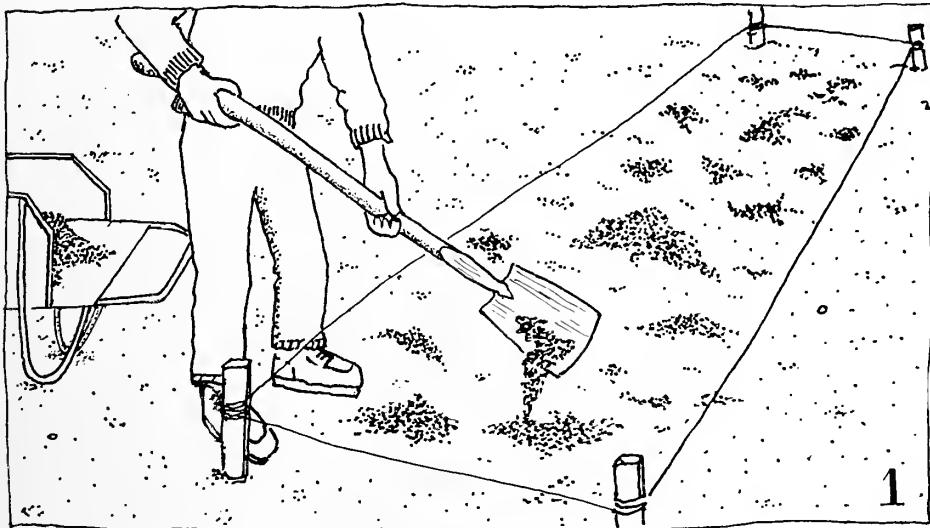
When you reach this point you will have achieved competency in the art of stir-frying vegetables and can go on to mixed vegetable-meat dishes. Good cooking! 

CENTURIES-OLD CHINESE CROSS-ROW RAISED-BED CULTURE OF VEGETABLES

Editors of *Gardens for All News*

All that intensive growing means is that you get more food from less space. That means you must have rich soil to feed all the plants, and be sure there's plenty of water for all.

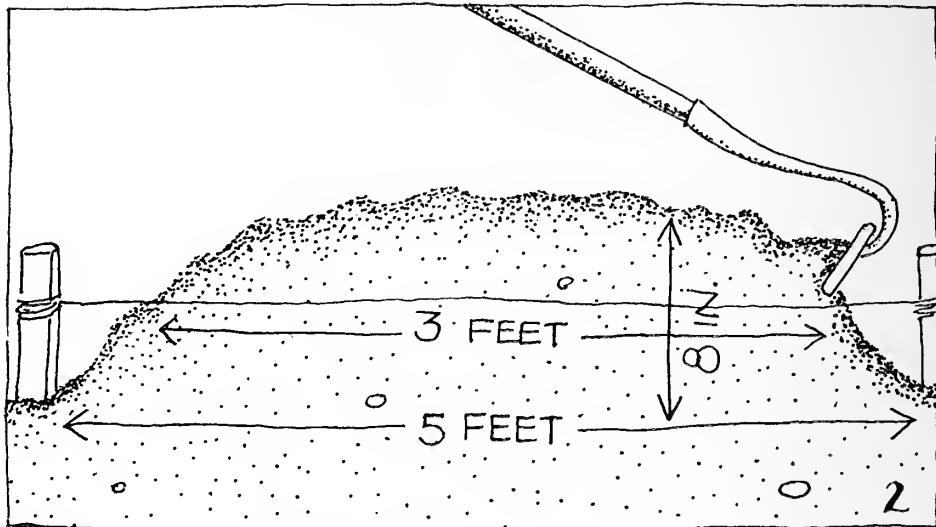
You can call it intensive gardening, the raised-bed method, or simply "bed culture"—it's the rewarding way to produce a lot of food in limited space. It isn't new, even though most Western gardeners still don't do it. The method has been an accepted practicality for hundreds of years. In China, it is still going strong, and that's a country where food production is no joking matter.



Drawings by Suzanne Fay

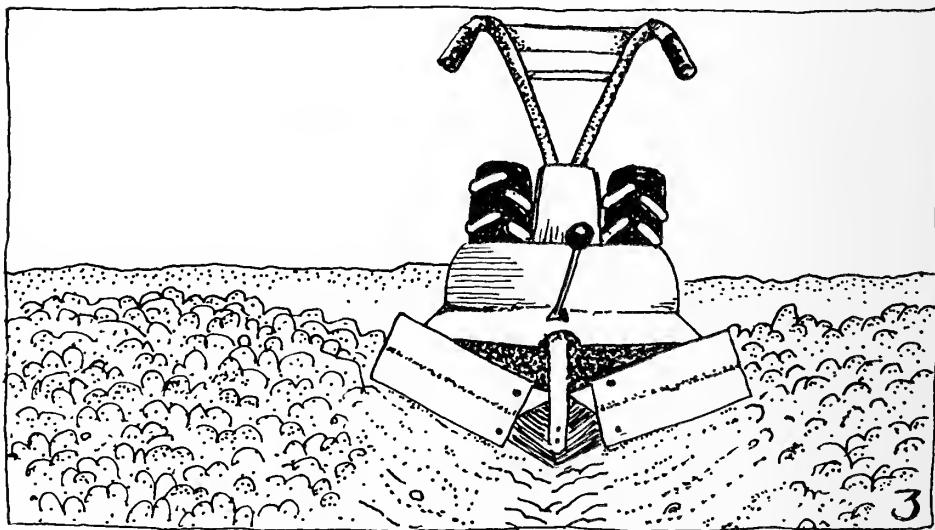
Laying-out and fertilizing raised beds

- Dig or till your raised bed area deeply (6"-8") so soil is loose and fine.
- Mark dimensions for each raised bed with stakes and string. To make sure you can comfortably reach the center from each side, we recommend making the beds no more than 3-4 feet wide. They can be any length you want.
- Leave about 2 feet between beds for walkways (because the sides of the beds slant, the walking space will be a bit less than that when you finish, but you'll still have plenty of room).
- Add fertilizer or compost on planting surface only, and rake in well.



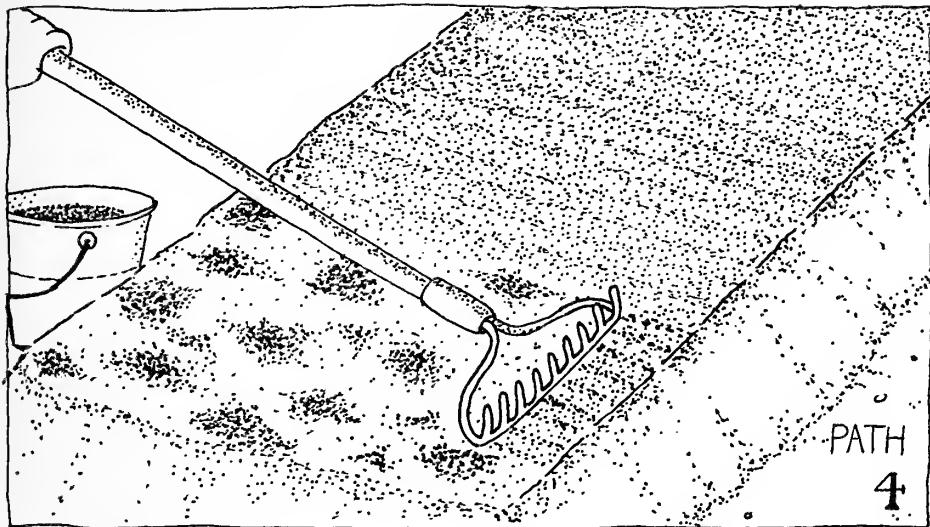
To form a raised bed with hand tools

- Stand in the middle of the walkway on one side of where the bed will be and use a hoe or rake to pull up soil from the path on the other side to build up the raised bed.
- Continue to move soil from the path along the entire length of the bed.
- Repeat from the other side to complete the bed.



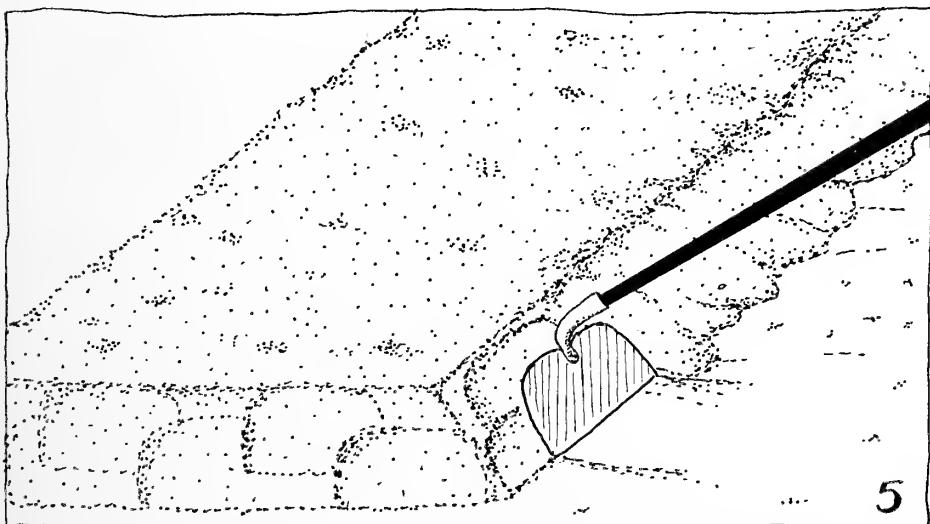
To form a raised bed with a tiller

- A tiller with a hillier-furrower attachment can be used to move soil from the pathways and build raised beds.
- At the end of where each raised bed will be, place stakes in the middle of the planned walkway.
- Line tiller up with the walkway stake and run it straight toward the stake to create bed and path at the same time. Make more than one pass in each path if you want higher beds.
- Repeat the process on the other side to complete each bed.



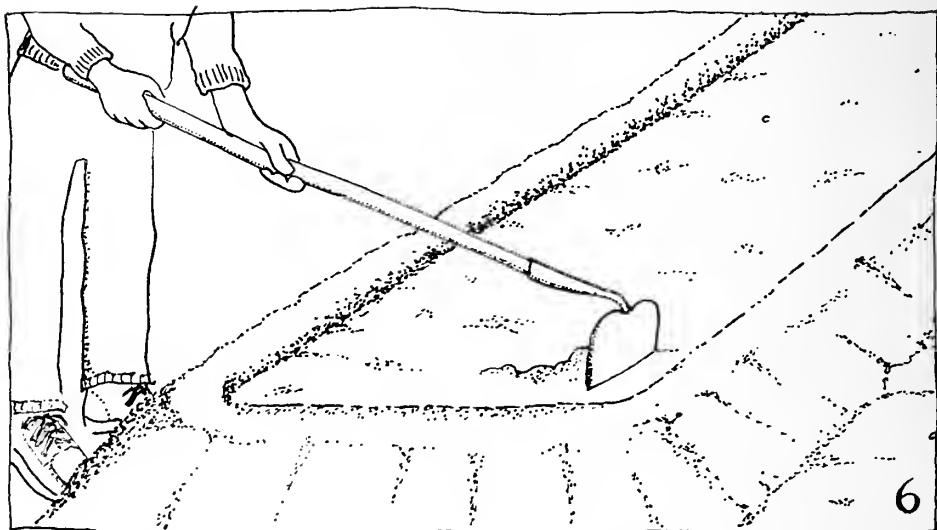
Finishing the raised bed

- Use a rake to smooth and level the top of each bed.
- You can add more fertilizer to the planting area of each bed and work it into the top few inches of soil as you smooth and level the surface if it's needed.
- Work only from the pathways. Try not to step on the planting surface.



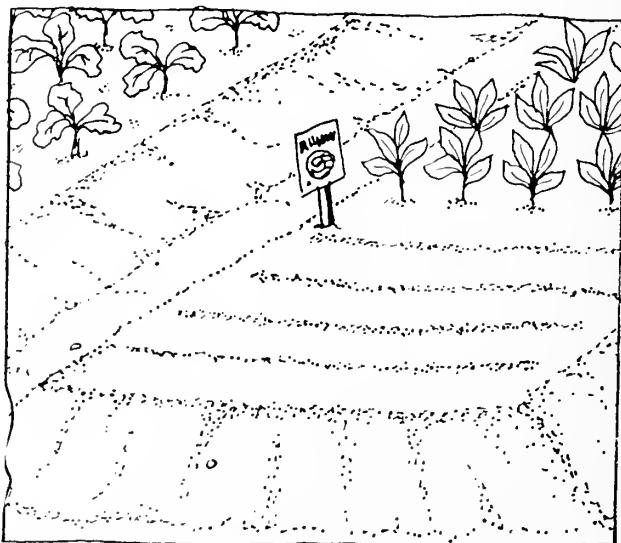
Finishing sides and edges of the bed

- Firm the sides and edges so the raised bed will keep its shape. Use the back of a hoe to tamp and firm the sides and end of each raised bed.
- Wait a few days before planting your finished bed so weeds will germinate and you can kill them easily by raking the soil. This is called "pre-emergent" cultivation. There will be fewer weeds to deal with later and your seeds will have less competition.



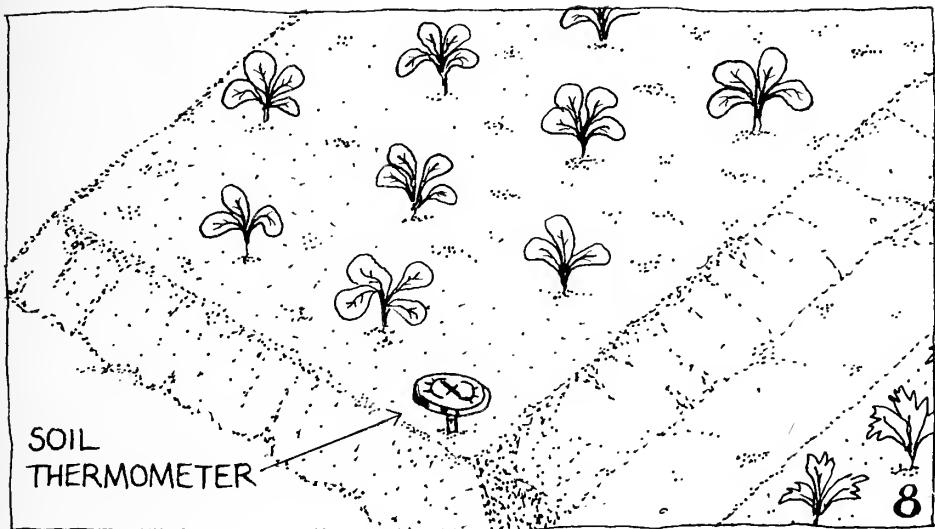
In dry areas try basin beds

- Use a hoe or rake to make a 2"-3" rim around the edge of the raised bed; it will keep water in.
- Firm the rim with the back of your hoe to make a low wall that keeps water where your plants need it most.



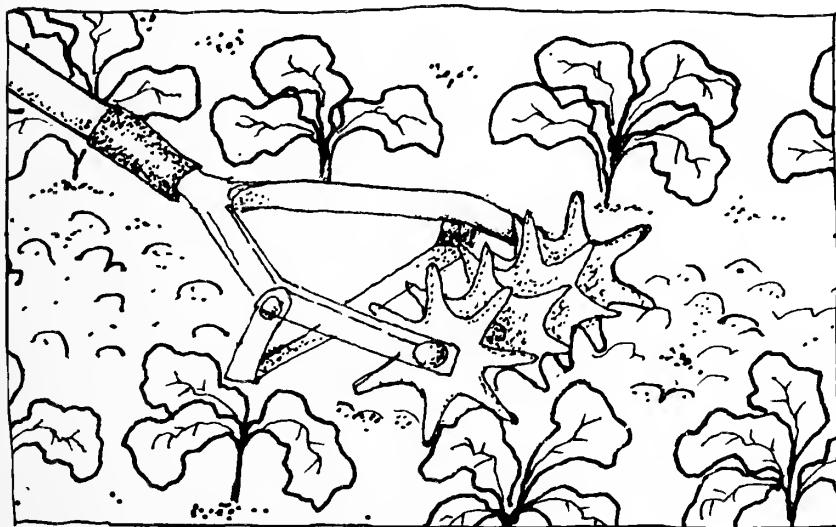
Cross-row planting

- Set seeds in multiple close-spaced rows across the width of the bed. Row planting wastes less seed, is easier to thin, weed, cultivate and harvest.
- Plant as you normally would, but because soil in raised beds is very loose and fertile, you can plant rows closer than seed packets suggest. Use the same spacing for distance between rows as is recommended for plants in the row.
- Thin seedlings in the row to recommended spacing. Properly spaced, mature plants will completely cover the raised bed, with leaf tips just touching.



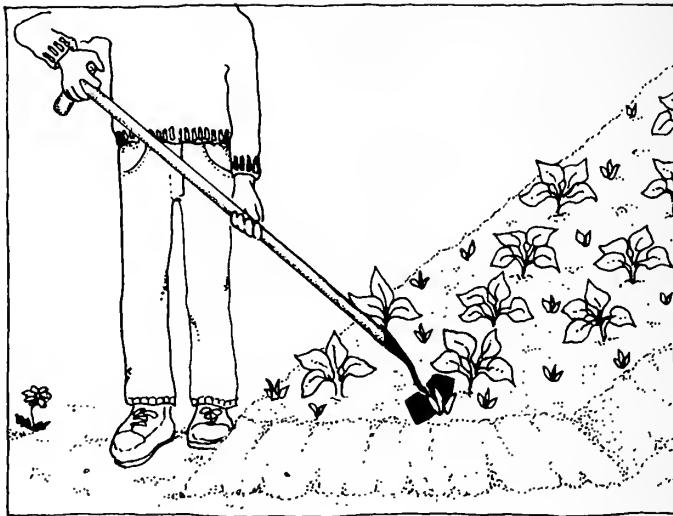
Stagger transplants

- Arrange equidistant those plants that grow quite large rather than planting in rows.
- Alternate 2 plants per row, then 3 plants, so all have equal room to grow.
- Set out transplants when the soil temperature is right for that variety. It is best to stake and prune tomatoes to one central vine when grown this way.



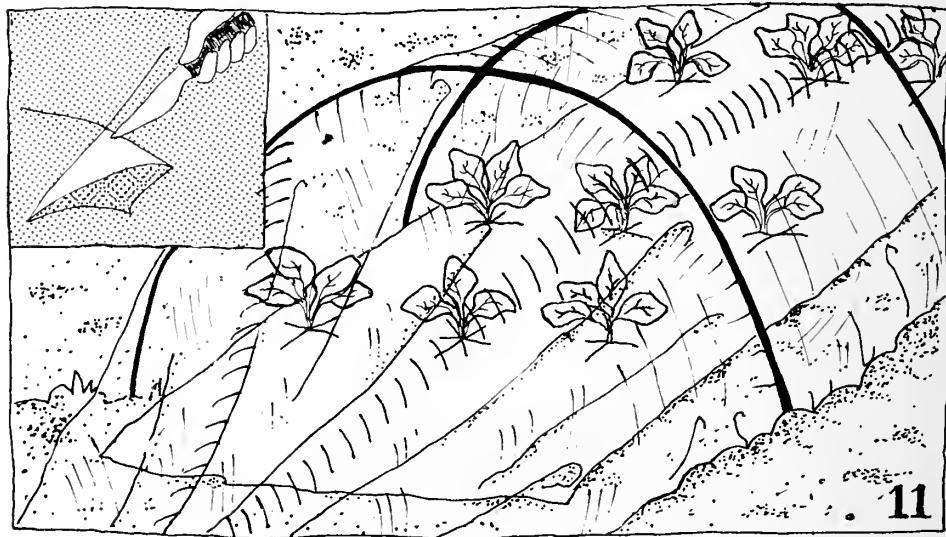
Cultivating close-spaced rows is easy

- All work can be done from the walkways.
- There are a number of cultivating tools designed to work when pushed or pulled through the soil that fit between close-spaced rows perfectly.
- Thinning plants in the row is easy because they are in a line.



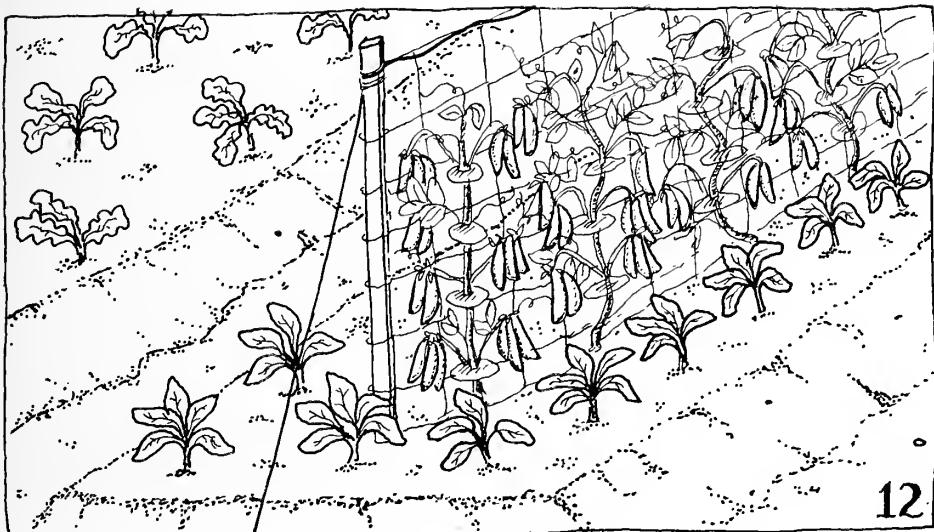
Weeding equally-spaced plants

- A "scuffle hoe," as illustrated, can make cultivating weeds easier. • This hoe cuts weeds off just below the surface, loosens packed soil, is easy to control and works when pushed, rather than by chopping up and down like a standard hoe.



Extending the growing season

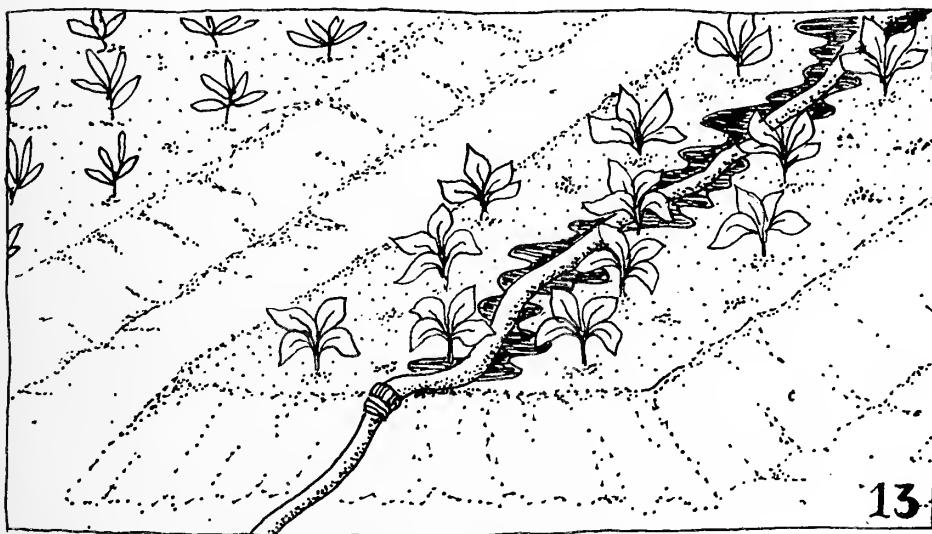
- Grow tunnels are good season-extenders on either raised or flat planting beds.
- Lay black plastic mulch on the soil and cut cross-shaped slits where transplants will be set; or make a long slit to expose a row of earth to plant seeds. • Insert metal hoops, bent into half-circles, in the ground about every 3 ft. to support a clear plastic sheet that forms a tunnel over black plastic and plants. • The sides and ends of the grow tunnel are buried under at least 4" of soil and weighted down with rocks or boards. • If the row cover does not have vents to prevent overheating during the day, fold it back on hot days.



12

Vertical growing on raised beds

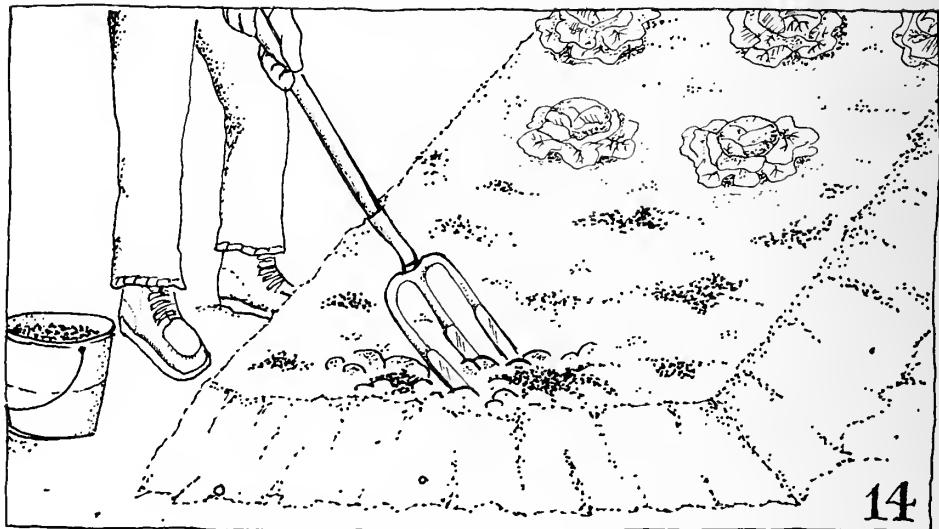
- Erect a trellis down the center of a raised bed to let your climbing vegetables grow upward, leaving room for other crops on either side.
- Use garden netting, chicken wire or fencing to support climbing vegetables.
- Plant crops that don't mind some shade, like spinach and lettuce, in the space between the trellis and the side of the bed.



13

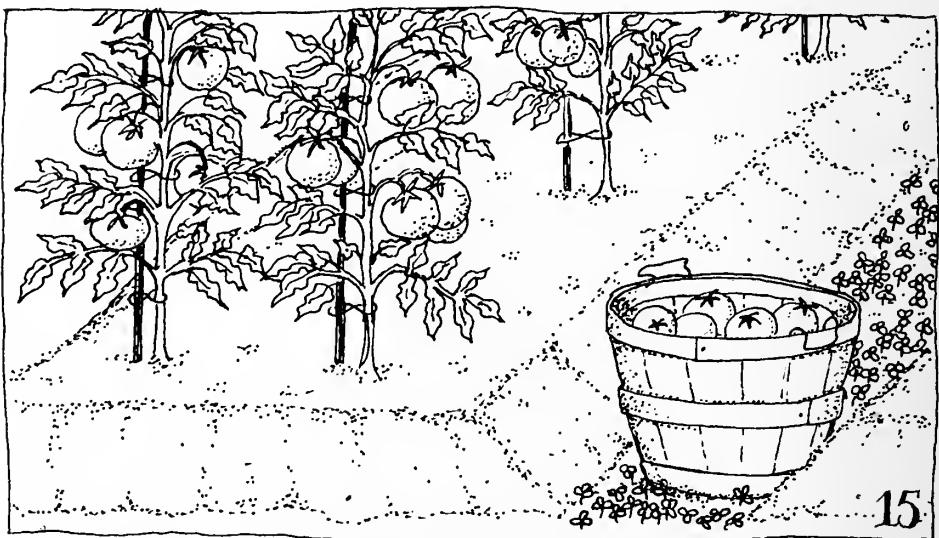
Efficient use of water

- A soaker hose (illustrated), drip irrigation systems or water breaker all deliver water efficiently to planting beds.
- The canopy of mature plants saves water by shading the soil, lessening evaporation.
- Deep, well-prepared soil rich in organic matter retains more water than soil in poor condition. To lessen evaporation from the sides of raised beds or in the walkways, mulch; or grow a living mulch of dwarf white clover.



Harvesting easier on raised bed

- You don't have to bend over as far because plants are raised up. • You don't have to move as much because there are many plants to harvest within arms reach.
- You won't compact the soil around growing plants while harvesting because all work is done from walkways. • As you harvest plants that are closely planted on raised beds you make room for the remaining plants to grow.



Spot-plant succession crops

- After harvesting a section of a planting bed you can easily re-plant that section to another crop. • Chop and turn under green plants right after harvest so they will break down quickly. • Add fertilizer to feed the new crop and help break down crop residues. • Prepare the seed bed deeply before you re-plant. (Seeds sown in the hot summer months may need to be planted more deeply because the surface dries out quickly.) ☺



Ling or water caltrop (*Trapa natans*) culture

VEGETABLE FARMING IN CHINA

Ernest L. Bergman

One of the most intensive vegetable production areas of the world is the Guangdong Province of South China. The main reason for this is the climate, which is frost-free the whole year. The minimum temperature is 32°F, while the average cold temperature is 46°F and the average high 95°F, which at many times is combined with 95 percent humidity. Annual rainfall in this region is about 76 inches. The location of this area is comparable to the Yucatan peninsula in Mexico.

Throughout the year there is a steady seeding, planting and selected harvesting of vegetables. Practically all work is done manually, including weed control. Most often water buffalo are used to plow the land. Vegetables are grown in beds approximately four feet wide. Depending on available irrigation systems, these beds can have deep ditches or just small paths around them.

Water is applied by sprinkling can, dipper, overhead sprinklers, big irrigation guns or by just raising the water level in deep irrigation ditches. A lot of manure is used and street sweepings are composted and applied to vegetable fields. Nitrogen, mostly in the form of ammonia or urea, is the only other fertilizer regularly applied.

In spite of no real winter, there are actually big weather differences during the year. February to June is the rainy season. July to September is very hot, and typhoons sweep the area between May and August.

About fifteen major kinds of vegetables are grown and, depending on kind and season, either monoculture or multiple cropping is employed. One can find as many as six different kinds of vegetables growing simultaneously in the same bed. Furthermore, again depending on kind, there can be as many as six harvests per year.

Vegetables can be put into five large groups with those comprising cole (cabbage relatives) crops being the largest. There are three distinct Chinese cabbages. *Pak choi* (*Brassica rapa Chinensis* Gp.) is most popular and looks like Swiss chard. A cylinder type and the tallest one is *pe tsai* (*Brassica rapa Pekinensis* Gp.), the true Chinese cabbage. The third type is *Brassica parachinensis* which is very similar to mustard but has slender stems and can be harvested within four weeks after seeding. Others in this group are cauliflower, Chinese broccoli which is cut twice from the same plant, head cabbage, kohlrabi, mustard and Chinese kale.

Group Two comprises the ever-present onion such as Welsh onion, bulb onion and forcing onion or garlic which is blanched like celery.

Group Three vegetables are shade-grown on bamboo over ditches to save space or over other vegetables to, in turn, shade them during the hottest weather. These are luffa (dish cloth gourd), yard-long beans, eggplants, cucumbers, gourds, edible-pod peas and large-podded pole-type peas.

Water-grown vegetables form Group Four. These crops, partially submerged in water at all times, include water convolvulus (water spinach), lotus, water bamboo and vine spinach.

The rest of the vegetables, (Group Five), tomatoes, peppers, Chinese radish (long white), celery (leafy type), ginger and beans, are grown throughout the year.

With the exception of the monoculture "water vegetables," all are grown in various combinations. This multiple-cropping prohibits mechanization and requires much manual labor. Furthermore, fertilizer appli-

cation is geared to general crop production rather than to the needs of individual kinds, such as root crops versus leafy vegetables. The whole cropping system has changed over the years due to the steady vegetable requirements by the urban population.

Here are five important combinations observed in the field:

1. *Pak choi* cabbage (chardlike), Chinese cabbage (tall), Welsh or blanching onion and kohlrabi.

2. Chinese broccoli, Chinese cabbage (tall), Welsh onion and celery.

3. Cauliflower, blanching onion, tomato, celery and kohlrabi.

4. Edible-pod peas (on bamboo in the center of the bed), celery, Chinese cabbage (leafy) and kohlrabi.

5. Yard-long bean, or luffa, or eggplant (all on bamboo for support and for shading), Welsh onion and Chinese cabbage (leafy).

Many more combinations of vegetables can be grown side-by-side, although some such as vine spinach and those growing in water are not suitable for multicropping.



Hand-cultivation of raised beds is a successful centuries-old Chinese agricultural practice.



Chinese water-chestnut harvest

BACKYARD WATER-CHESTNUTS

James Preacher

Reprinted with permission of *Organic Gardening and Farming*, © Rodale Press.

The Chinese water-chestnut is easy to grow. It's been neglected by U.S. gardeners because it needs a long season—the better part of a year. But you can start the plants indoors and get a prolific crop in much of the country. And you don't need a huge pond or elaborate equipment.

We produce up to twenty-five pounds of corms in a 5-foot diameter area right in our home garden. On a retail basis, that amounts to more than \$50. For beds we use plastic swimming pools—the kind found in most department stores for around \$5 each. The pools measure four to five feet in diameter and are about ten inches deep. Prepare the pool by cutting a 1-inch hole near the base of the pool side to allow drainage when needed.

Use a finishing cork to plug the hole when the pool is flooded. And that's all that's needed!

A good growing medium is a mixture of sand, well-rotted leaf and grass compost, ground rock phosphate, stable manure and a liberal supply of lime. The soil mixture need not be very special, but it must have a light texture. A soil too heavy with clay will inhibit corm production, prolong the drying time, and complicate harvesting. Put seven inches of mixture in each ten-inch-deep pool. This leaves three inches for later flooding. Moisten the bed to settle the soil.

About the time of the last killing frost in spring, plant the corms two inches deep and space about 30 inches apart, using only three corms per pool. A closer spacing will retard



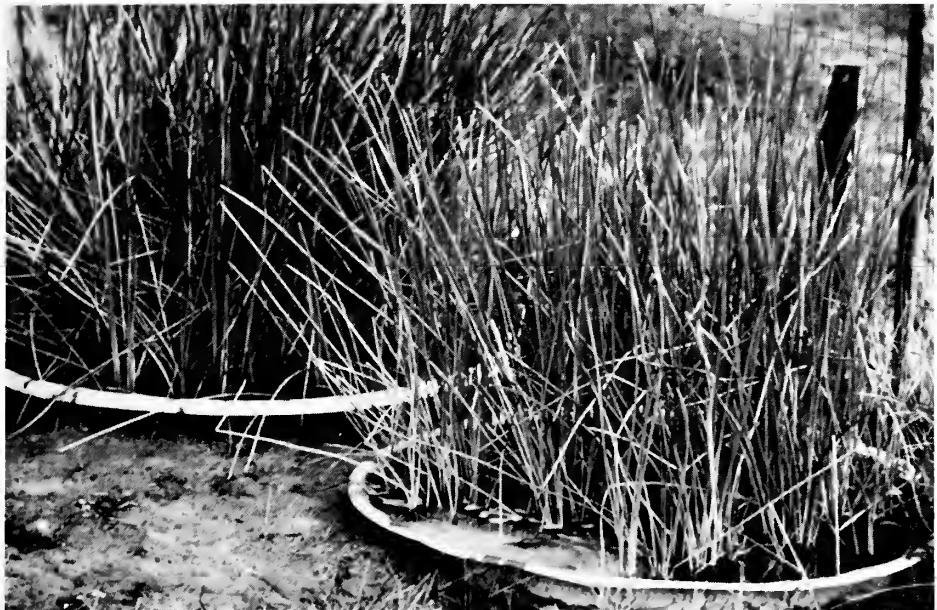
Three-week-old water-chestnut seedling grown in peat pot, ready to plant.

and reduce corm production. Take special care to place the corms with shoots at the top to avoid a delay in shoot emergence. Immediately after planting, flood the beds, then gently drain to settle the soil around the corms. In about three weeks or as soon as the shoots reach a height of ten inches permanently flood the bed to the top of the pool. Flooding is essential for good corm production.

The Chinese water-chestnut requires a frost-free season of about 220 days to reach full maturity. It is well suited for growing in the Charleston, South Carolina, area where we have a growing season in excess of 270 days. Water-chestnuts have been successfully grown in several other states, including, Virginia, North Carolina, Florida, Georgia and



At eight weeks the seedlings, in the pool, already have sprouted daughter plants.



At five months the water-chestnut plants are two-thirds of the way to table. It takes about 1½ months more for the starches in the corm to turn sweet.

California. In colder climates, the growing season can be extended by four to six weeks if you start the plants indoors or in a greenhouse. To do this, set corms in individual peat cups filled with a rich, friable soil mixture, and maintain at 60°F or higher. As soon as danger of frost is over, transplant the seedlings to a prepared bed. (The plants should be ten to fifteen inches tall by this time.) Flood the seedlings immediately after planting and let the water stand.

The mother plants rapidly send out rhizomes which give rise to daughter plants. When the daughter plants begin to appear, we add a cow-manure slurry. We drain the water, add the slurry, leave overnight and re-flood the pool. By late summer, the bed will be full of tubular stems which completely hide the soil and water. About the time that the plants produce their inconspicuous flowers the rhizomes start forming corms, so we add more manure slurry.

The corms develop quickly during a short period of time near the end of the growing season and reach maximum size (1½"-2") by early autumn. We remove the water from the bed about November 1. Draining the water

hastens maturity of the corms and makes harvest easier. The water chestnuts are allowed to dry for about six weeks, after which we cut and rake off the dried stems. The stems are an excellent mulch and compost.

Around mid-December in Charleston practically all the corms are full-grown, sweet and palatable. (If the corms are dug prior to maturity and eaten immediately, they will have a starchy rather than sweet taste.) The water-chesnut-laden soil is carefully removed from the bed with a spading fork and a flat shovel. Sift the soil through a $\frac{1}{2}$ "-mesh screen to retrieve all the corms. Take special care not to bruise or damage them. Collect the corms in containers, then wash them to remove excess soil and debris. Put the corms in shallow trays to dry. Slow drying in the shade is better than sun drying. When no moisture remains on the surface of the corms, they are ready to be stored. Pack them in moistureproof—but not airtight—containers such as plastic bags or glass jars with loose lids and place in the refrigerator.

You can order water-chestnuts from Van Ness Water Gardens, 2460 North Euclid Avenue, Upland, California 91786.



Winged bean (*Psophocarpus tetragonolobus*)

If your daylength is short, grow this . . .

“SUPERMARKET ON A STALK”

Alan D. Cook

In the late 1970s and early 1980s, the winged bean (*Psophocarpus tetragonolobus*) stirred some scientific interest and led a few journalists to spew accolades and worse from their word-processors.

“The soybean of the tropics . . .” one

reporter suggested; “Supermarket on a stalk . . .” raved several other articles.

Also called goa bean, asparagus pea and several other names, the species is of ancient and obscure origin (it first appeared in agricultural literature prior to 1700). It has been

cultivated for centuries in Southeast Asia—Malaysia, Thailand, the Phillipines and elsewhere.

As with many other beans, including soybeans, the tender immature pods (four-angled with membranous wings) may be quickly cooked (after about four minutes flavor is inversely proportional to cooking time). Mature beans are rich in oil, protein, vitamin E and calcium, and provide a bit of iron as well. Like other beans, this one fixes nitrogen, so it needs little fertilization. It's also tolerant of heavy soils.

But, the writers say, other beans don't have leaves as spinach-rich-and-tasty as those of winged bean, nor do other beans have starchy tubers that can do whatever potatoes do, and beat them twelve-to-one in protein content.

Want more? Well, the flowers, sauteed, are similar in flavor to mushrooms, and one source mentions that stems (presumably young ones) will remind us of asparagus. It's

a viney plant, needing trellis, fence, cornstalk or other support, but for a "supermarket" species, that's a small price.

The tone of this article portends "good news, bad news," right? Right. And what casts the shadow is the often overlooked phrase "of the tropics" in the second-paragraph quotation above.

You can grow this wonder bean in temperate zones; you can enjoy the spinachy foliage, the asparaguslike stems and the spud-beating tubers.

Flowers? Young pods? Mature beans? Sorry. Winged bean is physiologically wired for short days, and rarely flowers outside the tropics where daylength is only $11\frac{1}{2}$ – $12\frac{1}{2}$ hours.

So, if you're in near-equatorial latitudes or those with lots of equinox-type days after the last spring frost or before the first touch of winter, you can have the entire supermarket. Otherwise, some of the aisles may be closed. 

Growing Chinese Cabbage

"Chinese cabbage" is a term that includes as many goodies as a rabbit's Christmas stocking, but they can be divided into two major groups: *Brassica rapa* Chinensis Gp. (Group) (chard cabbage, bok choy, pak choy) which resembles celery and does not make a head; *Brassica rapa* Pekinensis Gp. varieties which form tight elongated heads. There are two subgroups. The first, napa cabbage or siew choy, makes short fat ovals. The second, pe-tsai or michihli, forms longer (over 13") and narrower heads.

Most Chinese cabbages are cool-season crops. When warm days entice tomatoes and melons to waltz, Chinese cabbage flees the scene, "bolting" into nonculinary flowering and seeding stages.

In New England and Midwest gardens, most Chinese varieties are best planted in July and August for September and October harvest. On the other hand, a gardener in Oregon boasts five harvests yearly, planting three times in spring and twice more in autumn. But how much of the world has such a long rainy and cool climate?

For the rest of us, there are slow-to-bolt varieties (Burpee's 'Two Seasons Hybrid' is one, other companies offer their favorites) that are more-or-less warm-weather-tolerant. Read catalogs, ask local authorities such as county cooperative extension agents, read seed packet instructions. Choose, plant, keep records; experiment each year until you get it right.

Choosing the better and best varieties for your area is only half the chore. Chinese cabbages (and other Oriental greens) are tenderest and tastiest when grown good and fast. "Good" is fostered by soils bawdily rich in organic matter; "fast" is implemented with water, plenty of water. If one uses the raised-bed method (see p. 29) with highly organic soil, it's almost impossible to over-water the garden.

However proficient you are at raising yard-long beans, Oriental radishes and cucumbers, even water-chestnuts, you can't be a good Oriental-food gardener if you can't handle the *Brassica rapa* gang. And you'll never do so if you don't get on with it. A.D.C. 

*Cucurbita pepo*

HOW TO GROW AND COOK VEGETABLE SPAGHETTI

Derek Fell and Phyllis Shaudys

The origins of vegetable spaghetti (*Cucurbita pepo*) are obscure. Botanically related to summer squash, it is native to Central and South America where all members of the squash family originated, yet nothing remotely resembling it can be found growing wild any-

where on the American continent. To complicate matters vegetable spaghetti is often confused with another vegetable with a similar common name, the Italian spaghetti gourd, or cucuzzi (*Lagenaria siceraria*). Related to bottle gourds, the cucuzzi is long,

slender and green-colored with a spaghetti-like interior when cooked.

The first discovery of vegetable spaghetti as a popular food was in northern China, where it has been grown as a food staple for centuries. It was especially popular in the Manchuria region of China, although how it got there from South America is one of the great mysteries of horticulture. (*Ed. note: Unusual Vegetables*, Rodale Press, mentions the introduction to the U.S. by a Japanese seed company, circa 1930.)

Growing Vegetable Spaghetti

Seed should be sown into the garden after danger of frost is past. Alternatively, seed can be started indoors in peat pots four weeks before the last frost date to plant out to produce earlier yields.

Seed should be sown 1" deep in "hills," each hill spaced 4'-5' apart. A hill is simply a mound of earth that has been raked from the surrounding soil.* The hills should be fully exposed to sun, well drained and fertile, preferably high in nitrogen and with lots of organic matter mixed in for moisture retention. In acid soil areas a sprinkling of lime at the rate of 5 lbs. per 100 sq. ft. is advisable.

Since the vines tend to sprawl you might want to consider growing them on supports of some kind, such as trellises, fencing, wire cages, A-frames. The vines produce strong tendrils which allow them to climb without help.

Insect and Disease Control

If your garden is prone to infestations of cucumber beetle, protect seedlings and transplants with an organic spray such as rotenone or pyrethrum, or a chemical spray such as Sevin. Cucumber beetles spread wilt diseases which are capable of wiping out a crop.

Squash vine borer caterpillars bore into vines and eat upward through the center. If a vine starts to wilt you can tell where the borer is by the hole and pile of sawdust or "frass." Take a piece of wire and poke it up the hole, or use one of the approved sprays. Squash bugs are brown sucking insects that attack during summer. Again, rotenone or pyrethrum are effective organic controls; Sevin

is a good chemical control. Cutworms—the larval stage of beetles—are also destructive of young squash vines, and the best protection is to create a collar around the stems using bottomless paper cups.

The most destructive squash diseases are bacterial wilt and powdery mildew. Bacterial wilt shows itself as a sudden wilting of the vines, and it is spread by the cucumber beetle. By controlling this insect you will avoid bacterial wilt.

Powdery mildew is a fungus disease that is prevalent in wet weather, forming white powdery patches on leaf surfaces, then causing the leaves to turn brown. General-purpose garden fungicides will control the disease, as will Captan. When watering plants avoid sprinkling leaves.**

Watering and Harvesting

Vegetable spaghetti likes plenty of water at all stages of growth, but water is especially important at time of fruit formation, since it is moisture that contributes to size and weight of fruit. If soil feels dry or leaves start to droop, water immediately.

Fruits begin to mature 80 days after planting. When ripe they change from ivory white to golden yellow. Cut the ripe fruit from the vine with several inches of stem attached; this helps to hold the fruit in good condition for storage. Place on shelves in a cool, dry place indoors and use within two months. To keep longer, cook the fruit, fluff out the "spaghetti" and freeze in plastic containers.

How to Cook Vegetable Spaghetti

Although there are a variety of ways to cook vegetable spaghetti, the best method is baking it whole in an oven at 375° for 45 minutes.

Before cooking, pierce the skin with a fork to avoid bursting. Mid-way through baking, turn the squash over to prevent scorch marks. The squash should yield to pressure when done. Using a fork, remove the seeds, then "fluff out" the spaghetti-like strands from the inside.

Preparation and Serving

As a pasta substitute: Serve while warm with

**Ed. note:* The hill system is closely allied to the raised-bed system (see p. 29).

***Ed. note:* Cultural suggestions relating to pests are applicable to most other viney crops mentioned in this Handbook.

seasonings and/or a sauce (light cheese sauce, mushroom sauce, spaghetti sauce, etc.). Use vegetable spaghetti to make low calorie lasagna.

Vegetable spaghetti puree: The cooked pulp can be pureed in a blender or food processor, then drained, to use in baking bread, cakes and other baked goods. This puree freezes well for later use. Puree small amounts at a time if using a blender.

Chopped vegetable spaghetti: The cooked pulp can be chopped for use in salads espe-

cially, but also for use in baked foods when long strands are not appropriate. For the crispest strands for salads, under-bake the squash by ten or fifteen minutes.

Roasted seeds: Vegetable spaghetti seeds may be rinsed several times, dried and roasted just as pumpkin seeds are prepared. 

This article was condensed from *The Vegetable Spaghetti Cookbook*, Pine Row Publications, Box 428, Washington Crossing, PA 18977.

Crisp, aromatic, hand-sized . . .

MY FAVORITE ORIENTAL MELON

F. Weldon Burge

Reprinted with permission from *Gardens For All News*

Recently I discovered the Golden Crispy hybrid melon.* It produces up to ten fruits per plant in a limited garden area. If carefully maintained, even a large container will suffice.

Golden Crispy certainly lives up to its name. It's so crispy-crunchy, you might forget it's a small Japanese melon. Similar in taste to a honeydew, it has a thin, edible yellow skin. The melon is oval-shaped and only about five inches long. It weighs about a pound, perfect for eating out-of-hand. Simply slice the fruit in half, scoop out the seeds, and eat it whole. The flesh is sweetly aromatic, white and crunchy like an apple.

Golden Crispy is an F-1 hybrid (*Cucumis melo* var. *acidulus*) of an Oriental melon which originated in Northern China centuries ago. The hybrid, developed only about ten years ago by the Japanese plant breeders at Takii & Company was bred for larger fruits, higher sugar content and disease tolerance. Today, Golden Crispy is used in Japan and Korea the way we in America use honeydews and muskmelons.

How to Grow

The trick is to start them early indoors and

then plant in warmed soil containing plenty of organic matter. They love long days with plenty of sunshine and relatively dry weather. I tried planting Golden Crispy in tomato cages, since the fruits are small. It worked perfectly.

Start the seedlings indoors around the time of your last frost. Plant the seeds in pots filled with ordinary potting soil. Two seeds are planted about $\frac{1}{2}$ inch deep in each pot. The seeds require a temperature of about 75°F to germinate, so I place the peat pots in a tray containing a heating coil, then water them by filling the tray about half full.

When the seedlings are about two inches tall, snip off the weaker plant in each pot with scissors. The remaining plants are pampered with moderate watering and full sun. The seedlings require sunshine or they'll become spindly, resulting in poor production later in the summer.

Golden Crispy, like all melons, prefers an extremely fertile, well-drained soil, so garden preparation is a must. When the garden is workable in the spring, till as much compost as you can spare into the melon patch. In May, about two weeks before moving the plants into the garden, spread a 30-inch-wide sheet of black plastic mulch over each row to warm the soil.

*Available from the Park Seed Company, Greenwood, S.C. 29647.



About the size of an avocado, Golden Crispy melons with their thin, edible skins are perfect for brightening-up a table or eating out of one's hand.

When the weather is sure to remain warm (night temperatures above 55°F), seedlings can be transplanted. Punch holes in the black plastic at four-foot intervals, then set the plants in the soil beneath, firming gently. Water the plants liberally with manure tea or transplant solution to give them a good start, then place a tomato cage or similar support over each plant.

When the plants are young, pinch off the tops of the vines to stimulate branching and increase production. Golden Crispy produces more female flowers on second branches, so pinching the vines is critical for maximum production. Train the vines to fill the cage and wait for the fruits to form.

When the Golden Crispy melons are a bright yellow, harvest them by cutting the fruits from the vine, leaving about an inch of stem on each. These melons don't store as well as the thicker-rinded melons, but they will remain crisp and tasty for up to two weeks if kept in the refrigerator. Usually they don't need to be stored that long, because they're eaten almost as fast as I can get them into the kitchen.

Besides being eaten whole, the melons can be diced for desserts or salads. (Try diced Golden Crispy in lime gelatin for a different treat.) You may not grow any other melons once you've discovered the versatility of this Japanese favorite.

JAPANESE HERBS—A PERSONAL VIEW

Mitsu Mizusawa

We use herbs somewhat differently from the way that you use them. We very seldom use herbs as spices as Westerners and the Chinese do. Mostly we use them like pepper, served on the table or parsley as garnish on the plate, which is called *yakumi*. There are three ways to use *yakumi*.

1. *Tsuma*. The characteristic of *tsuma* is that, like parsley, we do not necessarily eat them, yet they are all edible. For instance, we garnish *sashimi* (raw fish) with *tsuma* such as knotweed (*Polygonum hydropiperoides*), *myoga* (*Zingiber mioga*), beefsteak plant (*Perilla frutescens*), *ogo* (a type of greenish seaweed).

2. *Temimori* is something placed on top of food and eaten with the food, like dried grated bonito meat (a mackerel relative) on top of boiled spinach or chopped scallion and grated ginger on *tofu* (bean curd).

3. The narrow sense of *yakumi*. Grated *wasabi* (Japanese horseradish) is used as you do horseradish with roast beef. Seeds and shoots of beefsteak plant are used when we have *sashimi*, always with soy sauce. When we eat noodle soup we have chopped scallions and a typical herb mixture of sesame, false-nettle, prickly-ash, orange peel, red pepper, green seaweed and poppy seed, all dried and grated. We sprinkle it on noodle soup and some other foods. Every Japanese family keeps a bottle of this blend. (See p. 50 for a similar blend.)

You may sometimes find it hard to decide which is herb and which is vegetable. In Japanese food it is more difficult to find a conclusive factor between them—which item belongs to which category.

We use herbs when making preserved food but even then very seldom.

We do not use many herbs making cakes, but I suppose you do not either.

We sometimes use powdered prickly-ash, beefsteak plant, peppermint, ginger, rind of citron called *yuzu* or green tea powder. Leaves of cherry or Daimyo oak are used for wrapping soft rice cakes for steaming to enjoy the scent of them when we eat the cakes inside. Cherry-leaf cakes for Girls' Festival in March, Daimyo oak-leaf cakes for Boys' Festival in May.

To get flavor in cooking we mostly use dried grated bonito meat, dried seaweed and dried black mushroom (*shiitake*). We have been using them since olden days.

We are told that the herbs of Japan were imported as medicines and vegetables mostly from the Eurasian Continent by way of Southeast China or the Korean Peninsula in ancient



Wasabi, a pungent, horseradishlike herb, is highly favored as a grated seasoning.



Perilla or beefsteak plant (*P. frutescens*) is used both as a pungent, cinnamon-toned flavoring and as a garnish.

days. Even though there are some indigenous Japanese herbs, you find some similarities from the botanic point of view with Chinese herbs.

Right now we are surrounded with many kinds of vegetables which were imported and established here in Japan a long time ago and native wild plants which became domesticated. Regardless of the present plenitude of market vegetables, people still go out in the woods, fields and mountainsides to gather new shoots or young leaves growing wild. These wild vegetables possess strong yet delicate scents of their own. We go out gathering shoots just "to taste scent."

My grandmother knew all about herbs. She used to tell us names and what to eat and what not to eat. Also how to cook and preserve them. These scents bring us a message of spring. Now you may find them in supermarkets but they don't taste the same to me. I hope they stay wild, preserving their own preeminent and delicate taste.

It is typical of Japanese cooking to use fresh seaweed as herbs in many ways and also processed seaweed.

We have a different general idea of herbs from Chinese people. We separate herbs as medicine and food quite definitely. But since we call herbs *yakumi*, which characters are like the Chinese characters and which pronunciation is similar to the Chinese, we can definitely say the original idea of herbs was introduced by the Chinese.

Teas

The beverage tea (*cha*) may not belong to the herb category but since we have so many kinds of tea or drinks similar to tea, I dare explain about them to give you some idea. Originally tea was imported a long time ago

as a medicine from China. Its aromatic smell must have captured people's taste because it became habit to take it every day. Here is a list of teas.

Green tea and roasted (black) tea, powdered tea for tea ceremony. Some people re-cook leftover rice in fresh-drawn tea for their breakfast.

Kuko drink—use kuko leaves (Solanaceae).

Genmaicha—roasted unpolished rice with tea leaves.

Cherryblossom drink and orchid (Japanese kind of small and greenish orchid) drink—place a salted flower in a tea cup, pour hot water and let it stand for a few seconds till it forms a beautiful shape.

Seaweed drink—a pinch of dried and powdered *kobu* (seaweed), pour hot water.

These beverages are usually served at the happy occasions such as weddings and anniversaries.

Toso, sweet Japanese *sake* (rice wine) which contains seven kinds of herbs in a small cotton bag (like a tea bag). The seven kinds of herbs are cinnamon, orange peel, small red bean, root of Chinese bellflower, prickly-ash, root of *okera* (*Atractylis ovata*) and *hamabofu* (*Glehnia littoralis*) all dried and powdered. We drink this wine once a year to start the traditional New Year breakfast. Old people believed that to drink *toso* keeps you in good health and drives all the evils out of one's family.

This is all a layman's view of Japanese herbs. It is far from an academic point of view. It seems one cannot find an accurate and orderly record of herbs of Japan. I hope you find my explanations understandable, but since these things are cultivated in a different culture, it is very difficult to make precise explanations. 



The author's Shichimi spice shop, Kyoto

KYOTO'S TRADITIONAL "SHICHIMI" SPICES

Kimiyoshi Fukushima

The *shichimi* spices, which originated nearly 300 years ago during the Meireki era (1653-57), seem to have increased the popularity of spices in the daily food of people in Japan. The enterprise started as a tea booth near the revered Kiyomizu Temple in Kyoto—not far from the present location of the shop. In those early days, ground red pepper was prepared and sold to esthetic devotees who used it to warm themselves after bathing in the Otoba waterfall of the Kiyomizu Temple.

Through the years more spices were offered: ground sesame and ground prickly-ash seeds, also flavored green laver (large, edible seaweed). Finally, in 1816, a mixture of seven spices—namely, red pepper, white and black sesame, green laver, prickly-ash seed, perilla seed and hemp seed, all ground together—was developed and named *shichimi*, which means the "seven spices." Hence we

call ourselves *Shichimi-ya* or the "House of Shichimi."

Until the middle of the Meiji Era (1868-1911), the process of preparing *shichimi* was very primitive. The work was all done by hand with very simple tools. Since then electrically driven machinery has been employed.

During the wartime restrictions which became acute in 1943, the materials for preparing the spices became so scarce and difficult to obtain that we were almost forced to suspend operations. Notable advances were made in our business following World War II with the designing of new containers for the *shichimi* spices. Today our *shichimi* spices, filling new containers made of famous Kiyomizu ware, are widely distributed not only in Japan but throughout the world.

Shichimi spices are used in many foods. They are particularly good in boiled and pick-

The renowned Shichimi spices are further enhanced by the attractive containers in which they are packaged.

led vegetables, *miso* soups, *sukiyaki*, meats and fowl, noodles, *tempura* and roasted fish. The sharp taste of the spices blends well with the flavor of food and whets the appetite.

As well as the traditional spices, the House of Shichimi also prepares and sells wheat-gluten flavored with *shichimi*, bean-paste with *shichimi* added, perilla spice, salted cherry petals and *shichimi* pickles. 



Spices and Herbs Used in Japanese Cooking

Naomi Makihara

In Japan the wide range in climate from near-tropical to cold north country and in natural features (mountains, seacoast, plains and bogs) makes for an equally great variety of culinary herbs, spices and special food dishes.

Japanese cooking is generally plain. The main elements of our diet are rice (a staple) and other cereals, vegetables, fish and other marine life. Over the centuries, Japanese cuisine has developed to please not only the palate but the visual and tactile senses as well. Of course, high nutritive value is important, but the sensual pleasure to be found in eating is never neglected. Preparation of a meal involves arrangement of food in appropriate color schemes and attractive shapes, always agreeable in touch to tongue and teeth. Then follows consideration of harmonious table settings, with tableware of china, porcelain, bamboo, wood, gold, silver, tin or other materials. And finally, to achieve esthetic perfection, a Japanese garden. It takes skill, discrimination and imagination—in short, true artistry—to produce the desired effect. To me, this combination of nutritive and esthetic aims makes Japanese dishes flavorsome and beautiful.

Refined Japanese cooking reaches its zenith, I feel, in our beloved Kyoto. Ever since Senno Rikyu (1522-91) perfected the formalities of *kaiseki* (a light meal eaten before the ceremonial tea), culinary herbs have been more highly appreciated. *Kaiseki* is ever so popular these days and provides the inspiration for our modern cooking.

The change of seasons influences the selection and uses of various herbs and spices. A few sprigs of the herb that is selected to garnish any dish furnish the desired nostalgic touch of one of the four seasons that we Japanese so keenly feel. Herb growers therefore see that the demand is met. Seasonal herbs are brought daily to the market from growers who generally specialize in only one or a few kinds of herbs. Whether in season or not, seeds, sprouting buds, slightly-opened flowerbuds, young leaves, leaf-stalks, plant stems, sprays, fruits, roots and entire plants—all are generally available. 

HERBS USED IN NORTHERN JAPAN

Nobuhide Kato

Though most of the herbs commonly used in northern Japan are about the same as those used in other regions, we can claim a few native varieties and special uses for them.

Both the seeds and the surrounding fruits of the prickly-ash (*Zanthoxylum piperitum*) are popularly used as a spice, separately, ground up together or combined with pepper. This deciduous spiny shrub grows wild throughout Japan and is also cultivated in home gardens as a herb.

The young leaves of the prickly-ash are boiled with meats and fish to suppress their strong odors and are sometimes put in soups or added fresh to various dishes to enhance their flavor. They can also be boiled down with sugar, soy sauce and water, to be used as a seasoning for various dishes or combined with bean paste and used much as Americans use mayonnaise.

The leaves of the Japanese angelica-tree (*Aralia elata*), after being briefly boiled with leaves of prickly-ash, make tasty ingredients for a salad. Leaves of the related *Acanthopanax spinosum* are served in the same manner.

Kiri-sansho, the cake which is a specialty of our Tsuruoka City, makes the most of the prickly-ash flavor. The prickly-ash pods are roasted and ground to a powder with mortar and pestle. The powder is then blended with flour and kneaded into a cake. If the pestle

is made of *Zanthoxylum* wood, some of its substance rubs off (i.e., is gradually ground into a powder) and passes its flavor into the cake's ingredients. Nowadays, most people don't care what the pestle is made of, but discriminating cooks still cherish a pestle made from prickly-ash wood.

We northern Japanese like spring herbs with either a strong or bitter flavor and we call them "mountain vegetables." Once spring arrives, we long for them and hurry to fields, hills and mountains—or to the market—in search of them. "Mountain vegetables" grow well in gardens, and many kinds have been successfully cultivated in backyard gardens.

"Mountain vegetables" which are generally offered in the markets include *Cacalia delphiniifolia*, whose large maplelike leaves, which are not bitter, are served in salads, as boiled greens or in soups. Other popularly used plants are the tassel-flower (*Cacalia hastata* var. *tanakae*), plumed thistles (*Cirsium amplexifolium*), sweet coltsfoot (*Petasites japonicus*) and wormwood (*Artemesia princeps*).

Several varieties of plantain-lilies are readily available in the market-place. The large-leaved plantain-lily (*Hosta montana*) is widely used in salads and soups. On the other hand, *H. rectifolia* and the narrow-leaved, white-edged plantain-lily (*H. albo-marginata*) are rarely gathered, because their young leaves are neither tasty nor large enough.

Besides the above-mentioned herbs which are sold in grocery shops, the herbs described below are found growing wild nearly everywhere. The horsetail (*Equisetum arvense*), a nuisance as a weed, but a favorite food, the spore-bearing stems being gathered when very young before the silicon crystals develop in the cells. Equally popular are the asters (*Kalimeris pinnatifida* and *K. pseudo-yomena*), woodland chervil (*Anthriscus sylvestris*), common chickweed (*Stellaria media*), meadow-rue (*Thalictrum minus* var. *hypoleucum*), giant knotweed (*Polygonum sachalinense*), Japanese knotweed (*P. cuspidatum*) and sorrel (*Rumex acetosa*).

Many consider catbrier (*Smilax oldhami*)



The reddish fruits of prickly-ash are shown here split open, exposing the shiny black seeds.

the most popular herb of northern Japan. After a brief boil, the young leaves and stems of the growing tips are served in salads, especially fish salads, or are combined with soy sauce, vinegar and rice wine (*sake*).



A commonly eaten delicacy is the bulb of the handsome goldband lily.

Many Japanese enjoy the young leaves of the daylily (*Hemerocallis longituba*, *H. fulva* var. *Kwanso*, *H. middendorffii* var. *esculenta* and *H. exaltata*). Bulbs of the well-known goldband lily (*Lilium auratum*), which is abundant in the wild in northern Japan, and the equally familiar tiger lily (*L. tigrinum*, known here also as *L. lancifolium*), are such commonly eaten delicacies they might as well be called vegetables.

As a member of the Japanese Fern Club, I have investigated the uses of ferns as herbs in northern Japan, particularly in our Yamagata prefecture. The young fronds of the ostrich fern (*Matteuccia struthiopteris*) appear in great quantities in grocery shops. Since they are not as harsh-tasting as most ferns, they may be fried without any preliminary treatment. Used either in a salad or as boiled greens, they have a delicate flavor. Some people like the ostrich fern as seasoning in rice-bran paste. A variety of the North American cinnamon fern (*Osmunda cinnamomea* var. *fokiense*) and the bracken fern (*Pteridium aquilinum*) are popular spring items in the market. In the hilly areas throughout Japan bracken gathering is a popular annual outing which takes place in early spring. All these ferns can also be found in North America. ☘

Herbs of Japan

Osamu Suzuka

Since it is located from 28° to 46° North Latitude (about the north-south equivalent of New York to Georgia in the U.S.), Japan is almost entirely in the temperate zone. Adequate rainfall and temperatures warmed by ocean currents assure luxuriant growth of our temperate flora. Subtropical vegetation is characteristic of the extreme south, and an alpine flora abounds in the north and in the high mountains. According to Ronald Good (1963), Japan belongs to the Sino-Japanese boreal region; i.e., northern Japan is in the same vegetation region as south Sakhalin, and southern Japan is in the same one as Korea.

Indigenous plants growing under these temperate weather conditions are generally easily cultivated by methods common to temperate regions the world over—watering, occasional manuring and other attentions.

In the distant past, the study and uses of herbs in Japan developed largely under Asian influences. On the other hand, because of Japan's isolationist policy of the past few centuries, herbs which were indigenous came into their own. It was the nationalistic urge combined with the natural vegetation of our country that led to the cultivation of native varieties of herbs.

Even before the introduction of Western medical science to Japan, Chinese medicinal herbs and their indigenous relatives had long been in popular use. These, particularly along with native herbs, also have long been trusted folk remedies. ☘



Herb Garden Shrine in Koriyama, Japan

A BRIEF HISTORY OF JAPANESE HERB GARDENS

Haruya Shimada

Legend has it that Oriental medicine originated in China under the rule of Shen Nung (about 2780 B.C.). (Shen Nung was also reputed to be the sage of farming, which presumably also had its start under his rule.) It is said that Shen Nung beat many kinds of herbs with his red whip and then tasted them to discover which were best. Later he came to know those which possessed medicinal qualities.

In the later Han period (22-250 A.D.), a medical book appeared which was entitled *Shen Nung's Herbal*. It was not written by Shen Nung, of course, but probably by a Chinese Hippocrates of that age: perhaps by Chang Chung Ching or Hua Tuo. A version reconstructed from secondary sources is the only remaining copy of the *Herbal* left to us.

Shen Nung's Herbal classifies medicines into three grades. There are 120 "good" medicines which restore life, 120 "better" medi-

cines which restore energy, and 120 "best" medicines which cure sickness. The "best" medicines could not be used continuously over a long period of time, because many were of a poisonous nature and thus not unlike some of the present-day medicines.

From China to Japan

Japan was influenced by Chinese culture—and medicine was no exception. At first, Japan adopted Chinese medicines indirectly through Korea, but later directly from China.

In the fourteenth year of the emperor Kinmei (554), the herbalists Fan Liang Fong and Ting You Tuo came to Japan from Korea for the first time. Herb gardens had not yet been conceived, and herbs were still gathered in the wild.

In 701, the first year of the emperor Bunbu in the Nara period, a court physician was appointed; a residence was built for him, and

herb growers and students of herbs were named to study with him. They studied from herbals. All this was provided for by statute, after the Chinese system. Thus began Japanese pharmacology and herb gardens.

About the age of Tenpyo (729-748), the South Herb Garden was planted south of Heijo Kyu in Nara prefecture. According to history, a new palace was built here in the first year of the following reign (749) and a Great Thanksgiving Service was held. Somewhere near the presumed site of the South Herb Garden, in Koriyama City, Nara, the centuries-old Herbal Shrine may now be found.

In 753, a Chinese high priest who had advanced the science of medicine emigrated to Japan, and shortly afterward Chinese medicines were imported into Japan. It is interesting to note that many of the medicines imported in those times are perfectly preserved as dried specimens in the Shosoin, an imperial storehouse at Nara, built in 749-756.

The monument at Kyoto tells us that the court physician's herb garden was opened in the sixth year of Showa of the emperor Nintmei (839). Further details are not known; however, a clue to the contents of the court's herb garden is to be found in the Engi-shiki, the set of laws and ordinances established in the first quarter of the tenth century. The thirty-seventh of the fifty volumes of the Engi-shiki (905) contains a list of the kinds and quantities of herbs offered in tribute to the emperor. They total 210 in number and are presumed to be herbs gathered not only in the wild, but also those grown in herb gardens. It is reported that in Kazuno-gun, Yamashiro province, pink perfection (*Rehmannia glutinosa*) was planted as a tribute for the emperor. This planting may very well be included in the herb garden listing.

Flourishing in the "Dark" Ages

Thus the medical arts gradually developed, and books on medicine and medical "recipes" were published. This brief flowering of the study of medicine came to a temporary halt when Japan plunged into the dark ages (toward the end of the Heian period, which lasted until 1185, until the beginning of the Azuchi-Momoyama period, toward the end of the sixteenth century). Most culture stagnated during this time.

One exception to the general stagnation of

culture occurred during the Muromachi period (1333-1573): landscape gardening was conceived and developed and culture of ornamental plants as well as herbs became popularized. Among the widely grown plants of this period were such medicinal herbs as balloon-flower (*Platycodon grandiflorum*), tree peony (*Paeonia suffruticosa*), *Paeonia laciflora*, Japanese apricot (*Prunus mume*) and Japanese cornel, a species of dogwood (*Cornus officinalis*).

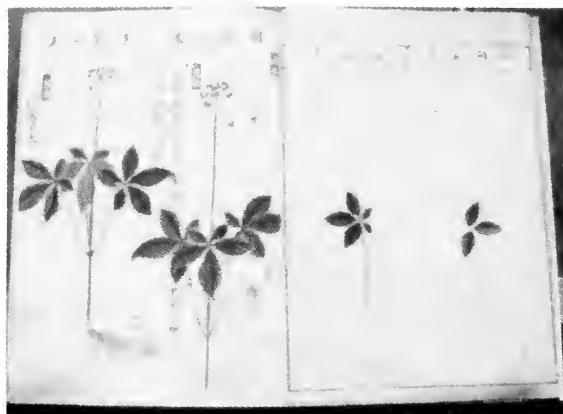
Records show that, despite the Dark Ages, the court physician's residence and herb garden, established by law in 701, continued uninterrupted.

During the Azuchi-Momoyama period, Oda Nobunaga permitted Portuguese Jesuits, whom he favored, to build a Christian church and plant a herb garden of some 120 acres in the foothills of Mount Ibuki, not far from Kyoto. It is no longer clear exactly where the garden was located. The record shows that many kinds of herbs were brought from Europe and grown there. Today such European plants as meadow peavine (*Lathyrus pratensis*), bush vetch (*Vicia sepium*) and herb Robert (*Geranium robertianum*) are found on Mount Ibuki. Since these plants grow abundantly in the wild there, but nowhere else in Japan, it is evident that they are the naturalized descendants of the plants from the garden of the Jesuits.

The Resurgence of Science

Tokugawa Ieyasu was the First Shogun in the Tokugawa period (1603-1867) who encouraged the development of science; consequently medical arts made great progress under his reign. The Second Shogun, Tokugawa Hidetada, loved ornamental plants so much that during his reign gardening came into fashion all over Japan. Herb gardens soon became necessary to provide liberal supply of herbs, also as a means of detecting the bogus plants then beginning to appear in the market place. They also provided a means for the further pursuit of medical studies.

In 1638, the Shogun established herb gardens on the north and south sides of Edo castle where he lived and held court. Each herb garden had a superintendent and ten caretakers. Why two herb gardens? In the first place, there had traditionally always been two schools of pharmacology. And sec-



The "Matsuyama Herbal" (named after the location of the Morino Herb Garden) was prepared by the garden's founder, c. 1735. The pages illustrate plants and seedlings of varieties of ginseng.

ondly, the Shogun hoped that the rivalry between the two would promote each herb garden to individual distinction.

The South or Asabu Herb Garden was on a site which is now part of Fujimicho, Tokyo. In 1684, the South Herb Garden was moved to the palace grounds of Koishigawa and exists today as the Koishigawa Botanic Garden, which belongs to Tokyo University.

The North or Otsuka Herb Garden was situated within the gates of the Gokokuji Temple, which was abolished in 1681.

South and north herb gardens were also established in that period on Takagamine, the northern hilly area of Kyoto. They supplied herbs chiefly to the Court. In 1680 Kawaguchi, magistrate of Nagasaki, opened a herb garden to grow the herbs brought by Chinese trade ships. It was in the seventeenth century that many of the feudal clans began to cultivate their own herb gardens, following the lead of the Shogun. The Owari clan opened its garden first in 1653.

In 1709, Kaibara Ekiken, an eminent scholar, published *Japanese Herbals* in sixteen volumes. Its four-volume supplement appeared in 1715. Another book, one of the first on growth and cultivation of crops in Japan, was written in 1696, but not published until later. This was the ten volume *Complete Agriculture* by Myazaki Antei. By this time the collection and classification of herbs had become a popular occupation.

The Eighth Shogun encouraged the development of industry and of the civil and military arts in the Kyoho period (1716-1736). Of the many herb collectors at this time the most eminent were Abe Tomonoshin and

Uemura Saheiiji. Tomonoshin, though dealing in herbs (as merchandise), at the same time furthered a knowledge of them. Saheiiji traveled and studied throughout Japan, collecting herbs for the Shogunate.

Saheiiji was sometimes accompanied on his herb-collecting tours by Morino Saikaku, who later established the Morino Herb Garden, the leading private herb garden of the time. Morino had collected plants on a grand scale, a most necessary practice for botanical study two hundred years ago—as it is today. In fact, the extent of his collection was quite unusual in comparison with those in other parts of the world.

From 1756 on, an Assembly of Natural History and Produce was frequently held. This resulted in improvement of varieties of plants, discovery of new kinds, and provision of a place for the exchange of plant seeds.

Besides the already-mentioned Asabu and Otsuka Herb Gardens, there were the herb gardens under the direct control of the Shogunate in Kyoto, Nagasaki, Komaba, Kuno-yama and Shunpu. Notable gardens of feudal clans were those of Nanbu, Aizu, Kumamoto, Satsuma, Kuroda, Akita and Shimabara. There were also many small private herb gardens, the largest of which was the above-mentioned Morino Herb Garden, which still survives in Chuda-cho, Nara prefecture.

Among the ancient herb gardens still in existence, this and the government-owned Koishigawa Herb Garden are Japan's largest.

Koishigawa Herb Garden

In 1684, fifty years after the herb gardens were first opened outside Edo Castle, the



The Togaku Laboratory in the Morino Herb Garden where Morino Saikaku, the founder, studied. On the right is a venerable *Stewartia pseudo-camellia*.

South Herb Garden was moved to Koishigawa, where 46,000 square meters (about eight acres) of ground were provided. In 1721, additional land—102,000 square meters ($17\frac{1}{3}$ acres)—was added. When the garden was extended, twenty-two kinds of plants were added from the Shogun's garden, forty-seven from Nagasaki, ten from Kyoto and eight from Nikko. Noro Genjo added eight kinds in 1724 which he himself had collected from the Izu islands.

When the Eleventh Shogun, Tokugawa Ienari, inherited the herb garden in 1792, he received presents of several plants each of Japanese cornel (*Cornus officinalis*), flowering pink and white apricots (*Prunus mume*), spike winter-hazel (*Corylopsis spicata*), Japanese witch-hazel (*Hamamelis japonica*), weeping forsythia (*Forsythia suspensa*) and a few dozen each of pink and striped camellias. The Herb Garden also customarily presented its herbs to the Court. It is also recorded that the women in Edo Castle used the juice gathered from the vegetable sponge, *Luffa cylindrica*, as their eau de cologne.

In the second year of the Meiji, after the

Meiji restoration (1869), the Koishigawa Garden was transferred to Tokyo University. Its name was changed to the Koishigawa Botanic Garden in 1875, and it remains under the management of Tokyo University to this day.

Morino Herb Garden

The Morino Herb Garden was established in 1729 in the lonely village of Matsuyama, Chuda-cho, Nara prefecture. It has continued to the present day as the most notable private herb garden in Japan.

Its founder, Morino Saikaku, was born in 1690. ("Saikaku" was his *nom de plume*; his real name was Tosuke, which members of his family retain to this day.) His family's business was the manufacturer of starch from the kudzu-vine. He was fond of plants and studied botany, becoming an avid collector, as mentioned above. In recognition of his meritorious work, the government gave Morino living plants to enrich his herb garden, among others: Russian licorice (*Glycyrrhiza glabra*), cassia-bark tree (*Cinnamomum cassia*), spicebush (*Lindera strychnifolia*) and Japanese cornel (*Cornus officinalis*).

His son Takesada carried on his work and built the Saikaku shrine in the herb garden in memory of his father. Morino's grandson Yoshinori concentrated on the family starch business and also managed the herb garden well. He erected a monument in memory of his grandfather close to the Saikaku shrine. The herbarium specimens which Morino Saikaku preserved were put in order by his youngest grandson in 1848. From them we can easily surmise what his garden was like.

It seems almost miraculous that a herb garden started by a humble man could be successfully maintained for two-and-a-half centuries by his family. Several reasons probably account for this.

The Morino family had achieved such success in manufacturing starch, first from the kudzu-vine and later from the fawn-lily (*Erythronium japonicum*), that it was appointed starch-supplier to the government. Their flourishing business allowed them to maintain a rich herb garden. Also, since the garden was in an isolated spot, it faced little change over the years.

And finally, perhaps a bit of supernatural aid. During his lifetime, the founder, Morino Saikaku, devoted all his energies to the herb

garden; after his death, his will provided that his hair and teeth be enclosed in wooden images of himself and his wife. These images, together with an image of his faithful servant Sahei, are in the Saikaku shrine in the herb garden, where they are honored to this day. I suspect their spirits have protected the garden.

Now the Morino Herb Garden is preserved as a place of historic interest. It is still the property of the Morino family, but the Ohuda Town Office has been appointed manager. Recently a museum was built to house the historic materials, monuments and books. The Town Office also built a rest house.

A huge maple tree (*Acer pycnanthum*), an aged hedge of cassia-bark tree (*Cinnamomum cassia*) and an old Japanese stewartia tree (*Stewartia pseudo-camellia*) are reminders of the more than two hundred years gone by. On the well-utilized hilly grounds, three hundred kinds of plants, about seventy percent of which were planted in the days of Morino Saikaku, are well preserved and cultivated.

The Morino Herb Garden is not far from Nara City. I hope readers will visit it on some future trip to Japan—which should include a sight-seeing tour of Kyoto and Nara. ☘

A Japanese Materia Medica*

The following are a few of the herbs used medicinally in Japan. The reader will note some duplication with the Chinese list (page 62).

Transliteration	Botanical and English name	Medicinal uses in Japan
Nokogiri-so	<i>Achillea sibirica</i> Siberian yarrow	Stomach tonic.
Shobu	<i>Acorus calamus</i> Sweetflag	Dried and powdered rhizomes used to ease digestion and fever; aromatic leaves used for medicated bath on the fifth day of the fifth month.
(Several)	<i>Alpinia</i> spp. Ginger lily	Seeds used to aid digestion.
Toki	<i>Angelica acutiloba</i> Angelica	Used to make a tonic for ladies.
Yoroigusa	<i>Angelica anomala</i> Angelica	Painkiller.
Gobo	<i>Arctium lappa</i> Burdock	Roots used to make tonic for strength, endurance, and aphrodisiac.

*Natural (unrefined) plants and plant derivatives can vary widely in the concentration of active properties. Some plant constituents, even in small quantities, can be extremely toxic. This list is presented only to illustrate the uses of plants in traditional Japanese medicine. **Medication of oneself without a doctor's supervision can be extremely dangerous and should not be attempted.**

Transliteration	Botanical and English name	Medicinal uses in Japan
Yomogi	<i>Artemisia princeps</i> Japanese mugwort	Closely related to <i>A. vulgaris</i> of Europe and North America; leaves yield moxa, a cauterizing agent and counter-irritant.
Ebisu-gusa	<i>Cassia tora</i> Sickle senna	A native of eastern U.S., seeds used as laxative in Japan.
Senkyu	<i>Cnidium officinale</i>	Grown in cool regions of Japan where roots are used to make tonic and pain killer.
Hato-mugi	<i>Coix lacryma-jobi</i> var. <i>mayeum</i> Job's tears	Tea made from boiled seeds is ingested to cure warts and to serve as a diuretic and anodyne.
Tsuyu-kusa	<i>Commelina communis</i> Dayflower	Dried foliage extract for diuretic and sore throat.
Oren	<i>Coptis japonica</i> Goldthread	A shade loving herb, roots yield medicine for stomach and intestinal ailments.
Ikari-so	<i>Epimedium grandiflorum</i> Longspur	Entire plants are dried and made into tonic.
Rindo	<i>Gentiana scabra</i> Rough gentian	Roots used for digestive tonic.
Gen-no-shoko	<i>Ceranium thunbergii</i> Perennial cranesbill	Dried foliage is astringent and digestive acid.
	<i>Gynura bicolor</i> Velvet plant	Used for goldfish diseases.
Dokudami	<i>Houttuynia cordata</i>	Dried plant used for diuretic and anti-dote for poison, also for tumors and wounds.
Hakka	<i>Mentha arvensis</i> var. <i>piperascens</i> Japanese field mint	Used for dentifrices and source of menthol and perfumes.
Ninjin	<i>Panax pseudoginseng</i> (<i>P. ginseng</i> , <i>P. schinseng</i>) Asiatic ginseng	Roots are made into tonic for heart trouble.
Yoshi	<i>Phragmites longivalvis</i> Japanese common reed	Extract of boiled roots is used to staunch flow of blood, as a diuretic, and as antidote for poison from spoiled meat and fish.
Kikyo	<i>Platycodon grandiflorum</i> Japanese bell flower, balloon flower	Roots poisonous but used for cough remedy.
Akane	<i>Rubia akane</i> Bengal madder	Red dye from roots, dried roots reduce fever and arrest hemorrhage.
Ware-moko	<i>Sanguisorba officinalis</i> Burnet bloodwort	Used as styptic for hemorrhages.
Koganebana	<i>Scutellaria baicalensis</i> Baikal scutellaria	Roots used to reduce fever.
Semburi	<i>Swertia japonica</i>	Used for stomach ailments.
Kurasu-uri	<i>Trichosanthes cucumeroides</i> Japanese snake gourd	Dried tubers used as diuretic and blood purifier, dried fruit used as soap substitute.
Kanoko-so	<i>Valeriana fauriei</i> European valerian	Roots used for sedative, nervous trouble, hysteria.
Kugai-so	<i>Veronicastrum sibiricum</i>	For rheumatism.

TRADITIONAL CHINESE MEDICINE

Chao Young

Traditional Chinese Medicine, or *Chung-I*, is a daily medical practice in China. *Chung-I* incorporates traditional techniques and methods as well as herbal medicine.

It is based on the tenet that a human being is a microcosm constantly interacting with the immense universe which influences and also controls every aspect of life. Early Chinese medicine incorporated philosophy and religion. Three essential religious/philosophical concepts that controlled early medical thinking were Tao, Tin-Yang, and the Doctrine of Five Elements.

The ancient Chinese distinguished five levels of the healing arts. The lowest was practiced by the veterinarian, or animal doctor. Next came the acupuncturist and herbalist who treated minor symptomatic problems. The third level was the surgeon who treated more serious, life-threatening injuries.

Second highest was the nutritionist who taught people what to eat; his was the science of longevity and preventive medicine.

But the highest of all was the philosopher-sage who taught the "laws of the universe." He was the only practitioner who could effect a genuine cure, for he went directly to the heart of the problem: the patient's inability to live harmoniously with Nature.

The medicinal agents used for healing are primarily natural products rather than synthetic chemicals. These natural products are derived not only from herbaceous and arborescent plants, but also from animal and mineral sources. The Chinese physician tailors the treatment to fit the individual patient's condition as well as the nature of the disease. The prescriptions usually contain many medicinal substances to produce synergistic action, or to neutralize negative interactions, or to mask the bitter taste of the crude (meaning unprocessed or natural) drugs. Chinese medicine uses complex mixtures of drugs for a slower, but more complete, healing process. Traditional Chinese medicine employs

drugs of low toxicity. The drugs do not produce a quick symptomatic effect, but rather work to increase the natural resistance and recuperative powers of the patient. This is the fundamental difference between Chinese medicine and the symptom-attacking single drug approach used in Western medicine. In addition to herbal medicine, other features and techniques of traditional *Chung-I* include acupuncture, surgery, physical therapy and massage.

This practice of traditional medicine is followed not only in China, but also in Japan, Korea, Indochina, Singapore and other parts of Asia. Thus, a third of the world's people receive some form of traditional Chinese medicine.

History

It is believed that in ancient times, while fighting for survival, the Chinese and people in other parts of the world must have acquired experience in selecting naturally available materials and to concoct healing potions to reduce fever, control suffering, counteract diseases and heal wounds. By trial and error, they gained practical knowledge that was useful in determining what minerals, animals or parts of specific plants possess the desired healing potentials and which ought to be discarded because of their toxicity. Knowledge of medicinal properties and instructions for correct usage have been handed down from one generation to the next.

In Chinese history, the three legendary emperors, Fu-Hsi, Shen-Nung and Huang-Ti are considered the founders of early Chinese civilization.

The Canon of Changes, or *I-Ching*, regarded as the most ancient Chinese philosophy and medicine is attributed to Fu-Hsi. Shen-Nung, also known as Yin-Ti, is the father of agriculture and herbal medicine. It is said that he tasted hundreds of herbs and other crude drugs in order to acquaint him-



Loquat or *pi-pa* (*Eriobotrya japonica*), a distant relative of apples, is an evergreen member of the Rose Family. The loquat fruit is used for pulmonary problems.

self with their properties. He is commonly credited with the compilation of the first *pen-ts'ao*, or Chinese *Materia Medica*.

In 2697 B.C., Huang-Ti, the Yellow Emperor, contributed a complete treatise on the principles of health and medicine known as *Huang-Ti Nei-Ching Su-Wen* (*The Yellow Emperor's Classic of Internal Medicine*). This classic consisted of eighteen volumes and although written more than four thousand years ago, it has been recognized as a most valuable treatise on internal medicine and is considered the world's oldest medical book extant.

Much later, during the Ming dynasty, the great pharmacologist and physician, Dr. Li Shih-Chen (1518-1593), studied more than eight hundred commonly encountered medicaments and traveled thousands of miles to collect known and unknown herb medicines. He examined the past editions of *pen-ts'ao* from the Tang, Sung and South Sung dynasties. Based on his own vast knowledge and twenty-six years of intense experience, he composed the *Pen-Ts'ao Kang-Mu*, an encyclopedia of naturally occurring drugs. It consists of fifty-two volumes in which 1,892 medicaments and 11,096 prescriptions are

listed and illustrated. He classified them according to source and properties into sixty sections of sixteen divisions.

In more recent times the distinguished pharmacologist and physician, Professor I. I. Brekhman, and his associates at the Academy of Science, Vladivostock, USSR, have spent more than thirty years concentrating on ginseng research. Professor Brekhman has written that medical science has not yet studied even a small part of the consolidated experience gained by the Chinese.

Modern pharmaceutical companies are spending huge sums of money exploring for and refining substances from plants. Contrary to the Chinese system, in preparing these substances many drug companies isolate the active principles from the whole plant. This separation and isolation may be a serious error because, in addition to the so-called active principles, there exists within the whole plant inactive principles and unique organizing principles that are not yet recognized or completely understood. It is felt by traditional Chinese practitioners that many of these other ingredients serve as natural buffers for the active substances and allow the drug to work gently and humanely.

Growing and Collecting

Many plants of the same species can survive only in a particular type of environment; others can grow in a variety of environments. As an example of this, ginseng (*Panax pseudoginseng*) is a perennial herb indigenous to the mountainous forests of Eastern Asia, particularly Eastern Manchuria (Liaotung area), North China, Korea and the maritime area of Siberia. The Chinese believe that the best ginseng in China is the mountain-type ginseng, called Manchurian or kirin ginseng, grown only in the Ch'ang-pai Shan area. In the old days, this particular top-quality ginseng was extremely scarce because it was difficult to collect. Research has shown that even though plants may be of the same species the percent and quality of composition—and thus their therapeutic applicability—may vary greatly according to certain factors, some of which are soil conditions and climate. In addition, the potency and translocation of plant constituents may even vary during the year.

The raw materials of traditional herbal

remedies include more than 4,877 plant species—dry leaves, barks, fruits, roots, stems, flowers, seeds and nuts. These remedies are either given as teas, decoctions, infusions or as mixtures compounded from the raw materials after processing by much the same techniques as those used by herbalists in the West, drying, shredding, grinding, boiling or fusing with certain solvents for extraction.

Numerous types of pharmaceutical preparations in forms such as powders, granules, pills, solutions, tinctures, medicated dressings, adhesive plasters, ointments and pastes are commonly found in traditional Chinese drugstores.

We purposely have not dealt with specific plant preparation in the body of the text, but rather have given the reader a sense of the history and place in Chinese culture that traditional medicine takes. For specific plant information please refer to the table listed. The accompanying table, not all-inclusive, should give the reader an idea of the many medicinal uses of plants. 

A Chinese Materia Medica*

Transliteration	Botanical and English name	Uses in traditional Chinese medicine
Tu-huo	<i>Angelica pubescens</i>	Carminative, antirheumatic, anodyne, dispelling chill.
Tang-kuei	<i>Angelica polymorpha sinensis</i> Chinese angelica	Supplements blood and stimulates circulation. Used for: menstrual irregularity, metrorrhagia, meridian and passageway obstructions, rheumatism, boils and ulcers, traumatic injuries, anemia, dryness and constipation.
Ai	<i>Artemisia argyi</i> also <i>A. vulgaris</i> Mugwort	Dispelling chill, relieving pains, hemostatic.
Yin-chen-hao	<i>Artemisia capillaris</i> Capillary artemisia	Antipyretic, dispelling moisture, cholecystagogue.
Pai-shu	<i>Atractylodes macrocephala</i>	Nutrient for the vital energy, stomachic, diuretic, for dyspepsia and anorexia.
Chai-hu	<i>Bupleurum falcatum</i> var. <i>scorzonerifolium</i> Hare's ear	Antipyretic, relief of chest oppression.
Chueh-ming	<i>Cassia tora</i> Chinese senna, sicklepod	Laxative, various eye and hepatic disorders.

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Transliteration	Botanical and English name	Uses in traditional Chinese medicine
Chu-hua	<i>Chrysanthemum morifolium</i> Florist's chrysanthemum	Antipyretic, sedative, refrigerant in headache, influenza. Beneficial for hypertension and atherosclerosis.
Tang-shen	<i>Codonopsis pilosula</i>	Tonic, improving the functions of digestion, salivant.
Shan-chu-yu	<i>Cornus officinalis</i> Japanese cornelian cherry	Astringent tonic in impotence, spermatorrhea, lumbago, vertigo, night sweats.
Yen-hu	<i>Corydalis yanhusuo</i> <i>Corydalis</i>	Invigorating circulation, used as sedative, analgesic and antispasmodic, for different kinds of pains.
Chuan-niu-hsi	<i>Cyathula officinalis</i> <i>Cyathula</i>	Invigorating circulation and reducing stasis antirheumatic.
Hsiang-fu-tzu	<i>Cyperus rotundus</i> Nut grass	Aromatic, stomachic, emmenagogue, analgesic.
Shan-yao	<i>Dioscorea opposita</i> Chinese yam	Nutrient tonic, strengthening the function of digestion.
Shih	<i>Diospyros kaki</i> Persimmon	Salivant, pulmonary soother, antitussive.
Pi-pa	<i>Eriobotrya japonica</i> Loquat	Antitussive and expectorant.
Tu-chung	<i>Eucommia ulmoides</i> Hardy rubber-tree	Tonic, nourishes the liver and kidney, hypotensor.
Lien-chiao	<i>Forsythia suspensa</i> Weeping forsythia	Antipyretic, antiphlogistic, antidote, swelling reducer.
Che-pei	<i>Fritillaria verticillata</i> var. <i>thunbergii</i> Chekiang fritillary	Antitussive and expectorant, for common cold and cough, ulcers and lymphogenous disorders.
Lung-tan-tsao	<i>Gentiana scabra</i> Gentian	Antipyretic, stomachic.
Yin-hsing	<i>Ginkgo biloba</i> Ginkgo	Antitussive, analgesic and invigorating circulation; for angina pectoris.
I-mu-tsao	<i>Leonurus artemisia</i> also <i>L. tatarica</i> Chinese motherwort	Invigorating circulation, emmenagogue, improve vision.
Nu-chen	<i>Ligustrum lucidum</i> Chinese privet	Roborant for physical debility.
Chin-yin-hua	<i>Lonicera japonica</i> Japanese honeysuckle	Clears fever and detoxifies.
Ssu-kua-lo	<i>Luffa aegyptiaca</i> Luffa	Relaxing sinews and muscles, anti-pyretic and expectorant.
Kou-chi	<i>Lycium chinense</i> Matrimony-vine, Chinese wolfberry	Nutrient tonic in diabetes, for fatigue-induced fever.
Hsin-i	<i>Magnolia quinquepetala</i> Red magnolia	Rhinitis, headache, vertigo.
Hou-po	<i>Magnolia officinalis</i> Magnolia-bark	Stomachic, astringent, diuretic, for dyspepsia and abdominal distension.
Po-ho	<i>Mentha arvensis</i> Field mint	Diaphoretic, antipyretic, antipruritic and carminative, for the common cold, headache, sore throat and early symptoms of measles.
Sang	<i>Morus alba</i> White mulberry	Diuretic, pulmonary soother.

Transliteration	Botanical and English name	Uses in traditional Chinese medicine
Lien	<i>Nelumbo nucifera</i> Sacred lotus	Tonic.
Shao-yao	<i>Paeonia lactiflora</i> Chinese peony	Anodyne, antispasmodic and emmenagogue, for menoxenia, dysmenorrhea and diarrhea.
Jen-shen	<i>Panax pseudoginseng</i> Ginseng	Tonic to the five viscera, quieting the spirits, establishing the soul, allaying fear, expelling evil effluvia, opening up the heart and brightening the eyes, benefitting the understanding, invigorating the body and prolonging life.
Tzu-su	<i>Perilla frutescens</i> Purple perilla	Carminative, expectorant, pulmonary soother.
Pan-hsia	<i>Pinellia ternata</i>	Antitussive, expectorant and anti-emetic, for pregnant vomiting, chest distension.
Chieh-keng	<i>Platycodon grandiflorus</i> Balloon flower	Expectorant and antitussive, in combination with other herbs for influenza, sore throat and tonsilitis.
Yuan-chih	<i>Polygala tenuifolia</i> Slender-leaved milkwort	Sedative, expectorant.
Ho-shou-wu	<i>Polygonum multiflorum</i> Chinese cornbind	Intestinal emollient, tonic.
Hsia-ku-tsao	<i>Prunella vulgaris</i> Selfheal, heal-all	Antipyretic and diuretic, for scrofula, ophthalmia, vertigo and hypertension.
Mei	<i>Prunus mume</i> Japanese apricot	For chest oppression, salivant, antidote.
Shih-chun-tzu	<i>Quisqualis indica</i> Rangoon creeper	Vermifuge.
Ta-huang	<i>Rheum</i> spp. Rhubarb	Purgative, stomachic, astringent and antimicrobial, for intestinal or stomach fever, constipation and acute infectious hepatitis, also for internal hemorrhages.
Mei-kuei-hua	<i>Rosa rugosa</i> Rugose rose	Carminative, for chest oppression, blood soother.
Tan-shen	<i>Salvia multiorrhiza</i> Red-rooted sage	Invigorating circulation and reducing stasis, used as antiinflammatory, sedative and analgesic, for cardiovascular disorders.
Ching-chieh	<i>Schizonepeta tenuifolia</i>	Diaphoretic, antipyretic and antidote for the common cold, tonsilitis.
Hsuan-shen	<i>Scrophularia ningpoensis</i> Ningpo figwort	Antipyretic, antiphlogistic and antidote for the late period of fever, dry throat and constipation.
Huai-mi	<i>Sophora japonica</i> Japanese pagoda tree, Chinese scholar tree	Hemostatic, blood purative.
Mu-hsiang	<i>Vladimiria souliei</i> no common name	Carminative, analgesic, swelling reducer.
Hua-chiao	<i>Zanthoxylum simulans</i> Szechuan pepper, prickly ash	Dispelling chill, antihelmintic.
Chiang	<i>Zingiber officinale</i> Canton ginger, true ginger	Dispelling chill, stomachic, stimulant.

A DICTIONARY OF ORIENTAL HERBS AND VEGETABLES

About 130 common varieties of vegetables are said to be grown in China alone. Add those used in Japan, Korea, Vietnam, Thailand, the Philippines and other Far Eastern areas and the list is enormous. Herbs and spices—commercially produced, home-grown, and collected from the wild—are countless.

Nomenclature is frustratingly difficult, especially with common names because of myriad languages and dialects and many styles of transliteration.

The brief descriptions of some vegetables and culinary herbs here are taken from a number of sources, many from Japanese writers in Brooklyn Botanic Garden's *Handbook of Japanese Herbs and Their Uses*, Plants & Gardens Vol. 24, No. 2.

Also see "Japanese Herbs" on page 48, "Getting to Know Chinese Vegetables" on page 4, "Vegetables Used in Thai Cuisine" on page 20, and other articles.

Allium chinense

Chinese onion

This neat, dainty onion came from China to Japan in ancient times. Widely cultivated and used, it produces lovely pinkish-purple flowers in the autumn.

The bulbs, which have a mild odor of onion, are pickled in vinegar, with either sugar, honey or soy sauce added. They can also be preserved in salt, *sake* lees (rice wine sediment) or sweet *sake*.

The flower stalks attain a height of 1-to-1½ feet, bearing thirty flowers. It is a lovely plant for borders or rock gardens.

The bulbs are dug out in the second or third year after planting, after the leaves wither in early summer. By this time they have multiplied.

Yashiroda

The whole plant is used in salads, soups, and stir-fry. In soup, chop fine and add at last minute; do not overcook. "Welsh" comes from the German word "welsche" (meaning "foreign").

Beatty

Allium fistulosum

Welsh onion, *negi*

As the common onion is to Westerners, *negi* is to us Japanese. It is said to be native to western China. In some cultivated varieties, the hollow leaves attain a length of 1½ to 3 feet.

Visitors to Japan should taste its green leaves or, better yet, its blanched stems and crowns in *sukiyaki*. Many other Japanese dishes contain *negi* in some form.

Yashiroda



Welsh onion or *negi* (*Allium fistulosum*)

Allium spp.**Onions****Aralia cordata****Udo**

We particularly enjoy the many distinctive flavors of the varieties of onion (*Allium*). Among our favorites are chives (*A. schoenoprasum* var. *foliosum*), *asatsuki* in Japanese; *A. grayi*, (*nobiru* in Japanese); *A. tuberosum*, (*nira* in Japanese); and *A. victorialis platyphyllum*, (*gyoja-ninniku* in Japanese).

*Susuka***Angelica keiskei****Angelica**

This bold aromatic herb looks just like garden angelica (*A. archangelica*), but is a long-lived seacoast perennial. *Angelica keiskei* grows in the southern parts of Japan.

Much like garden angelica, *A. keiskei* is used candied and in salads and condiments. *A. edulis*, a native of the northern mountainous regions, is similarly used. *A. ursina* is found in Hokkaido and on the mountains of northern Japan; its stems and leaf-stalks, stripped of bark, are frequently eaten.

Yashiroda

Angelica archangelica, very similar to its Japanese relative *A. keiskei*.

Years ago this bold-foliated perennial herb was introduced into the United States from Japan. That great explorer David Fairchild tried *udo* and proved it to be as tasty as any native vegetable. It is widely distributed in Japan, north China and Sakhalin, and we grow some cultivated varieties extensively.

The mild, agreeable flavor of the young, asparaguslike shoots is refreshing, especially after blanching. Generally only the young shoots are blanched. They contain asparagine. *Udo* shoots are sliced and used in soups, vinegared foods and many other dishes.

*Yashiroda***Arctium lappa****Burdock, gobo,
ngan pong**

Roots and young shoots are scrubbed or scraped and soaked in cold water to prevent darkening and to remove bitterness. The roots do not have much flavor but they absorb flavor during cooking. Simmer for about an hour before using in stir-fry. (Ed. note: Roots grow as deep as two feet or more. Harvesting may involve the use of a posthole digger to make a shaft alongside the root.)

*Beatty***Artemisia princeps****Japanese mugwort**

This perennial Japanese weed is underfoot everywhere. It is closely allied to North American and European mugwort (*Artemisia vulgaris*). It grows 2 to 4 feet high, with silken, gray-lobed leaves and minute flowers of a yellowish-brown color.

Any country-bred Japanese will feel nostalgia for Japanese mugwort rice dumpling, with its delightful color and aroma. After being slightly boiled, the young leaves are pounded into the rice dumpling.

The young leaves are also used in soups and salads after their bitterness has been removed. Artemisia tea is also occasionally prepared.

Yashiroda



Aster yomena

Aster

This species is a common sight in rice fields and elsewhere in very moist soil. Like those in the United States, however, our asters are difficult to identify and often confuse even botanists. Thus, when I speak of *A. yomena*, it is in a broad sense, since other species may be included in the same category.

Aster yomena grows 1 to 2 feet high, with lanceolate leaves and daisylike purple-blue flowers.

After being slightly boiled, the aromatic young leaves are used in salads or as fried greens.

Yashiroda



Yashiroda

One of the Japanese asters (*A. yomena*) of which the young leaves are eaten.

The roots of *gobo*, or Japanese burdock (*Arctium lappa*).

Benicasa hispida

Winter melon,
ash pumpkin, *zit-kwa*

Fruit is eaten as a vegetable when immature and as a preserved sweet pickle when ma-

ture. The essential ingredient in winter melon soup. Should never be overcooked.

Beatty



Winter melon (*Benicasa hispida*)

Cacalia delphiniiifolia

Tassel-flower

A woodland plant about 2 feet high, its flowers are inconspicuous, but its delphinium-like palmate leaves are pretty. The young leaves are eaten freshly chopped for their flavor or enjoyed with soy bean paste or other foods. The related *Cacalia hastata* var. *orientalis* is a perennial herb attaining a height of 6 feet. Its young leaves are used in the same way.

Ohyama

The young leaves and tips, slightly boiled, are used for salads or fried in oil. If eaten continuously and in large amounts, however, the plant occasionally produces toxic symptoms.

Yashiroda

Chrysanthemum coronarium Cooking
chrysanthemum, chop suey
greens, garland chrysanthemum, *shungiko*, *t'pngho*

Chenopodium album
var. *centrorubrum*

Lamb's quarters

This stout shrub with vigorous stem grows to a height of 5 feet. It is supposed to be a nourishing herb, introduced from the South in ancient times.

Shoots and young leaves are used raw and in soups and stir-fry. Often parboiled and plunged in cold water to preserve its bright green color before using. Do not overcook. Fresh yellow flowers are used raw; dried flowers are boiled a minute and seasoned with salt and vinegar.

Beatty



For culinary purposes, chrysanthemums of low bitterness and preferably yellow, such as 'Niigita', are used.

***Chrysanthemum
morifolium***

Among the ornamental chrysanthemums, strains having no bitterness are selected for use as cooking chrysanthemums. These are as easy to cultivate as ornamental chrysanthemums, but they require a cool climate. The cooking chrysanthemum is largely cultivated in the northern part of Honshu.

When the flowers (yellow-petaled are preferred) are fully opened, they are harvested. After a brief boil, the florets ("petals") are spread out in a thin layer and then dried.

Susuka

Cirsium dipsacolepis

Of sixty species of our native thistle, this one is raised commercially for its flavor. Reaching a height of 2 or 3 feet, it bears pale lavender thistle-heads in early autumn. Its stature is not unlike that of the common thistle.

The spindle-shaped roots grow 8 or 9 inches long and are three-quarters of an inch in diameter. They are preserved in *sake* lees or bean paste and used after a time. They can also be eaten boiled, or sliced and fried to bring out their strong agreeable flavor. The thick roots of fragrant thistle (*C. purpuratum*) and *C. maritimum* are also eaten.

Yashiroda

Shokoyu-giku

Citrus junos

Uzu

A small cultivated evergreen tree related to the orange. Its fruits and flowers are both in wide demand because of their delightful flavor and fragrance. The strong acidic juice is used year-round as a condiment.

Makihara

Cryptotaenia japonica

**Japanese wild
chervil, *mitsuba***

Perennial woodland herb of which roots, stalks and leaves are used in soups, salads and as greens as flavoring and garnishes. Often used raw; do not overcook. (Ed. note: Botanically related to *C. canadensis*, native to North America.)

Beatty

Thistle

Cucumis melo

Japanese melon, *uri*

Vines are vigorous and are usually allowed to spread on the ground instead of on a trellis. Fruits are eaten raw or cooked with mixed vegetables and meat dishes or pickled. (See "My Favorite Melon," page 46.)

L.A. Dept of Arboreta and Botanic Gardens

Cucumis sativus

*Cucumber, kyuri,
tseng kwa*

Fruits are used raw, cooked or pickled. Very young fruits with flower still attached are used as appetizers; mature fruits are often stuffed.

Beatty

deep in the sand. The short stem produces long-petioled leaves which are bold pinnately compound.

The young leaves and leaf-stalks are used for their agreeable flavor and fragrance. They are pickled for their fragrance and are often served with sliced raw fish. *Susuka*

Curcuma domestica

*Turmeric, yellow
ginger, wong keung*

Widely cultivated in Indo-Malaysia and other Oriental areas, this species produces a rhizome that when powdered is used for flavoring and yellow coloring and dyeing, and is the basis of curry powder.

Cook

Glycine max

Soybean, wong tau

Has been grown in China for 4500 years or more. Hundreds of varieties are now cultivated world wide. Ripe seeds are a farm crop; tender immature pods are a garden vegetable. Both are rich in protein. Black-seeded kinds are higher in protein, yellow-seeded in oil content.

Cook

Filipendula multijuga

Meadowsweet

Japanese and American species of meadow-sweet are similar. Our meadowsweet grows 1 to $2\frac{1}{2}$ feet high and displays showy panicles of white flowers in the summer.

In the North, after being boiled with ash and well soaked in water, the young tips are used in soups or salads, or they are fried. The odor is quite strong.

Because of its flowers and graceful growth, it is a popular garden plant. Another Japanese meadowsweet (*F. purpurea*) is closely related to *F. multijuga*, but it has crimson flowers and purplish stems. Both have been grown in gardens since olden times.

Yashiroda



Fuzzy pods of soybeans (*Glycine max*)

Foeniculum vulgare

Fennel, wooi heung

Seeds and foliage are used for anise flavoring and decoration. Stems used in stir-fry. Slightly crushing the seeds releases more flavor.

Beatty

Glehnia littoralis

Corkwing, hama-bofu

This perennial herb is found on sandy beaches throughout Japan. The root grows

Gynura bicolor**Velvet-plant**

This purple-leaved native of the Molucca Islands was grown and esteemed as a culinary herb in ancient times, but now is rarely seen. It reaches a height of 1 or 2 feet, with lanceolate leaves.

The succulent foliage is eaten flavored with a sauce or *sake*, soy sauce and vinegar.

Yashiroda

Hydrangea macrophylla
var. *serrata*

Tea-of-heaven

This small deciduous shrub, a variety of the florist's hydrangea, has narrow, elliptical leaves. In summer, flowers in shades varying from blue to pink appear in a large, dense, rounded cluster. They are sterile, that is, seeds never form.

The withered leaves, when dried and rubbed in one's hands, become very sweet. "Sweet tea" is made from them. The sweetness is said to be twice as strong as that of saccharin. In many temples, "sweet tea" is offered to worshippers on the anniversary day of Buddha's birth.

Yashiroda

Lactuca sativa

var. *angustana*

**Asparagus lettuce,
celtuce**

Leaves are used as salad or greens. Succulent stem eaten raw or used in stir-fry. The name celtuce was invented by Burpee for the introduction of the vegetable into the U.S. in the early 1940s.

Beatty

Laportea macrostachya

**Woodnettle,
*Mi-yama-ira-kusa***

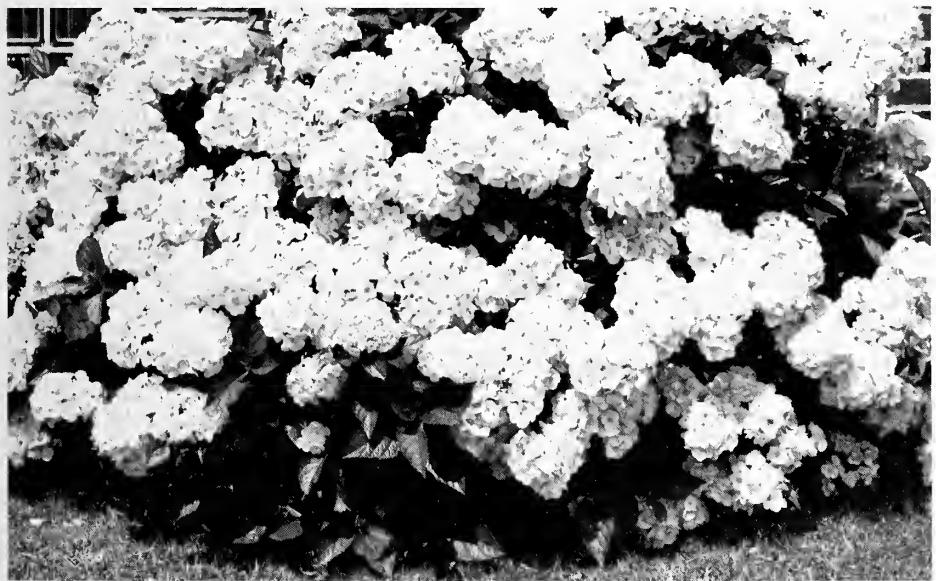
A perennial herb similar to stinging nettle. Its young stems have a peculiar sweetness when boiled or preserved.

Ohyama

Lilium lancifolium**Tiger lily**

Bulbs are parboiled to remove bitterness. Lilies which are grown for their flowers in the West have been grown for their edible bulb for a thousand years in the Orient.

Beatty



Hydrangea macrophylla

George Tidmarsh

Luffa aegyptiaca **Dish cloth gourd, luffa,
loofah, *shui kwa***

Immature fruits are used in salads, soups and stir-fry. Mature fruits have a fibrous skeleton which until the invention of the plastic sponges were much used. Still used as scrubs for bathing. *Beatty*

Beatty

Matteuccia struthiopteris Ostrich fern

One of the loveliest woodland ferns used in gardens. Its young uncurling leaves ("fiddle-heads") are eaten as boiled greens.

Ohvama

***Oenanthe javanica* Water dropwort, seri**

This perennial, flavorful herb grows in marshes and along streams and spreads by creeping stems. In autumn, young shoots sprout from the nodes and tips of the creepers; they are highly prized for cooking. Should you chance to be in the outskirts of Matsue, western Japan, in winter—particularly before New Year's—you would see

many little flat-bottomed boats moving about in the shallow waters of *Oenanthe* or *Seri* plantations. *Seri* grows from Hokkaido, northernmost Japan, to Queensland, Australia, in the far south.

Though it is picked and used year round, it is at its best from autumn to early spring. It is one of the best greens for *sukiyaki* in winter. The finely chopped leaves add flavor to soups, salads and chicken. The slender white roots grow about 1 foot long in the water and are highly esteemed for cooking.

Yashiroda

Perilla frutescens

Beefsteak plant, perilla, *shiso*

Leaves and tender shoots are used for garnish and are deep fried in butter. Flower stems and seed pods are used as garnish.

Beatty

***Perilla frutescens*
‘Crispa’**

Purple perilla, shiso

The purple-leaved cultivated variety of *peppermint* is an annual herb which resembles orna-



Perilla frutescens 'Crispa'. Young flower spikes are used in tempura.



The flower-heads of *Petasites japonicus* are used for their agreeable but bitter flavor.

mental coleus and which reaches a height of 8 to 16 inches. Its leaves, flowers and seeds give off a unique fragrance caused by an organic compound called perilla-aldehyde.

The tiny seedling plants are used as a spice for sliced raw fish. The leaves are used as a spice for bean curd and as a garnish for *tempura*; the seeds are used in *tempura* and as a spice in making various pickles. Purple-leaved perilla makes an effective coloring for pickled apricots, ginger and the tubers of Japanese artichoke (*Stachys affinis*). Perilla grows well in home gardens, but the seeds will not germinate without first being exposed to a low temperature. *Susuka*

Petasites japonicus Sweet coltsfoot, *fuki*

This perennial herb grows in the wild in damp, mountainous places from Honshu south to Shikoku and Kyushu. It is also commonly grown in home gardens and extensively raised for the market.

Its large, light green leaves are borne on leaf-stalks 1 or 2 feet long. The leaf-stalks have an agreeable flavor. Long before the leaves appear, in the midst of winter, large, round chartreuse flower-heads emerge close to the ground. The unopened flower heads are esteemed for their bitter though agreeable flavor.

The leaf-stalks are first placed in boiling water, then in cold water. The bark is peeled, and the leaf-stalks are ready to be used either as seasoning or an entire dish in themselves. They can also be preserved with

salt, sugar or rice-bran. After the unopened flower-heads are treated first in boiling then cold water, they are served with or without soy bean paste. *Yashiroda*

Petasites japonicus *giganteus*

Giant sweet coltsfoot, *akita-buki*

Akita City in northern Japan is popularly called the City of *Akita-buki*. This perennial herb is distributed from northern Japan to Sakhalin and the Middle Kurile Islands. With circular leaves 5 feet in diameter and leaf-stalks almost 6 feet high, giant sweet coltsfoot is an impressive sight.

It is more than just impressive looking, it is edible. The leaf-stalks are tasty whether plain boiled or pickled for use in winter as a flavorful green for soup; they are also preserved as pickles with bean paste, *sake* lees (the sediment from the wine cask) or sugar. When *sake* lees are used, *shochu*, a distilled spirit, is generally added. The flowerbuds, which appear before the leaves in very early spring, are prized as a condiment since they have a slightly bitter yet agreeable flavor. They may be eaten while still green with soy bean paste or boiled down in soy sauce.

The plant is not restricted to use in cooking alone. The mature leaf-stalks can be worked into walking sticks, a firm rod being inserted in the hollow center. The leaves themselves may be used to make a delicate imprint on wrapping paper and craft paper, which have a variety of uses. *Ohyama*

Polygonum hydropiper Smartweed, *tade*
var. *fastigiatum*

When we say *tade* we refer to the species and its varieties. *Polygonum hydropiper* is supplied to the market in large quantities throughout Japan and is used in restaurants, hotels and homes. It is marketed and used in the seedling stage—a few days after the seeds have germinated.

A popular Japanese proverb about the herb is: "Each to his own taste; some worm will devour *tade*." *Tade* is unbelievably hot to the taste; still it is a big favorite.

The pungency of *tade* is different from that of *wasabi* and pepper. Its fresh leaves are used as a garnish for such favorite Japanese dishes as *sashimi* (sliced raw fish), *tempura* (fried batter-coated fish) and *sushi* (vinegared, boiled rice combined with other foodstuffs). After a mouthful of a particular dish, one savors a *tade* leaf. *Hamada*

generally have tapered ends; Chinese have blunt ends. There are many varieties of both. Used raw in salads, cooked in stir-fry or stew, or pickled.

Tsang and Ma

Sesamum indicum Sesame, *goma*

Black or white sesame seeds, whole or ground, are used for seasoning or decoration. Sesame oil is used for stir-frying and deep frying.

Beatty

Smilax oldhamii Catbrier

A woody climber, its young leaves are boiled for greens in May and June.

Ohyama

Thymus Japanese thyme
quinquecostatus

It closely resembles common thyme (*T. vulgaris*), but with slightly longer leaves and purple-tinged foliage. Its use, culture and harvesting are the same as for common thyme. That is, its leaves, either fresh or

Raphanus sativus Japanese radish,
longipinnatus *daikon*

Similar to and in same group as Chinese radish, *lo bok* (see page 10). Japanese varieties



© Suzuki

Smartweed or *tade* is eaten in every stage of growth, from germination to flower spikes. The leaves are ground for a vinegar paste.

dried, are used for seasoning soups and meat dishes. Its culture, as a small, slightly woody plant, makes no special demands on the grower.

Yashiroda

***Vigna angularis*, Azuki bean, red bean
(*Phaseolus angularis*)**

Tender pods used as green beans. Shelled beans used for sprouts and for sweetened red beans and red bean paste used in cakes and desserts.

Beatty

***Wasabia japonica* Wasabi**

A perennial herb resembling horseradish in flavor, *wasabi* is cultivated on the banks of streams and not salable until after three to five years' growth. Its grated rhizomes add a pungent flavor to raw fish and soups, and its pickled leaves can be used as garnish.

Makihara

***Zanthoxylum piperitum* Prickly-ash,
*sansho***

If a Japanese were planning a herb garden, surely this spiny, deciduous shrub would be among the first choices.

It is extremely hardy and is found in the wild in Japan, Korea and in the north of China. There is also a spineless variety.

Young leaves are used in soups and in many dishes. The fruits are either grated or

preserved in soy sauce. They are also used as a medicine.

Yashiroda

***Zingiber mioga* Myoga (or *mioga*)**

The fragrant foliage of *myoga* resembles that of true ginger, but, unlike ginger, the horizontally-growing rhizomes are inedible. In spring, the rhizomes produce shoots about a foot high; several oblong-lanceolate leaves clasp the shoots with their long sheaths.

After blanching, the young shoots are used in soups, in *tempura*, pickled and as a spice for *tofu* (bean curd). In whatever dish the shoots are used, they enhance the fragrance and add a pleasant tang.

Common ginger grows best in shady, damp places—not where there is sandy soil or direct sun. It is said to be a pentaploid plant with 55 chromosomes and is sterile (does not bear seed). Propagation is by division.

Susuka

***Zingiber officinale* Common ginger,
shoga, *Canton ginger***

Originally not found in Japan, *shoga* is now as widely cultivated and used there as in other temperate and tropical lands. The young rhizomes are used as a pickled garnish to enhance the taste of broiled fish. The chopped rhizomes and the juice are added to soups and other dishes. (See page 17.)

Makihara



Stylized *myoga* or ginger flowers from *Japanese Design Motifs*, Fumie Adachi, translator, Dover Publications.

Some sources of seeds and/or plants for Oriental vegetables and herbs.

W. Atlee Burpee Co., Warminster, PA 18974
Casa Yerba, Star Route 2 Box 21, Days Creek, OR 97429 (Catalog \$1.00)
Horticultural Enterprises, P.O. Box 340082, Dallas, TX 75234
J.L. Hudson, Seedsman, P.O. Box 1058, Redwood City, CA 94064
Le Jardin du Gourmet, P.O. Box 424, West Danville, VT 05873
Kitazawa Seed Co., 356 W. Taylor St., San Jose, CA 95110
Johnny's Selected Seeds, Albion, ME 04910
Mellingers, 2310 W. South Range Rd., North Lima, OH 44452
Nichols Garden Nursery, 1190 North Pacific Hwy., Albany, OR 97321
Northrup King Seeds, Minneapolis, MN 55413; Fresno, CA 93776
Geo. W. Park Seed Co., Inc., S. C. Hwy. 254, N. Greenwood, SC 29647
Sandwich Islands Seed Co., P.O. Box 30125, Honolulu, HI 96820
Seeds Blüm, Idaho City Stage, Boise, ID 83707
Thompson & Morgan, P.O. Box 100, Farmingdale, N.J. 07727
Tsang and Ma, 1306 Old Country Rd., Belmont, CA 94002
The Urban Farmer, Inc., 2200 Halburton Rd., Beachwood, OH 44122
Vermont Bean Seed Co., Way's Lane, Manchester Center, VT 05255
Dr. Yoo Farm, P.O. Box 290, College Park, MD 20740

Additional Reading

Most seed companies give cultural and cooking information in their catalogs. Particularly helpful are Johnny's Selected Seeds and The Urban Farmer, Inc. (See above.)

Adventures in Oriental Cooking. Ortho Books, Chevron Chemical Co., 575 Market St., San Francisco, CA 94105.

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Kuo, Irene. *The Key to Chinese Cooking.* Alfred A. Knopf, N.Y., 1977. Includes descriptions of vegetables and herbs and mail order sources.

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Magic of the Orient. A brochure by The Urban Farmer, Inc., 2200 Halburton Rd., Beachwood, OH 44122.

Miller, Gloria Bey. *The 1000 Recipe Chinese Cookbook.* Grosset & Dunlap, N.Y., 1970. Includes descriptions of Chinese ingredients and mail order sources.

Oriental Cook Book, 1970, and *Wok Cook Book,* 1978. Sunset Books, Lane Publishing Co., Menlo Park, CA 94025.



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**A man does not plant a tree for himself;
he plants it for posterity.**

—Alexander Smith

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- 86 GROUND COVERS AND VINES
- 74 ANNUALS
- 87 PERENNIALS AND THEIR USES
- 56 SUMMER FLOWERS FOR CONTINUING BLOOM
- 96 BULBS
- 59 FERNS

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- 41 FLOWERING TREES
- 67 FRUIT TREES AND SHRUBS
- 66 RHODODENDRONS AND THEIR RELATIVES
- 65 TREE AND SHRUB FORMS—THEIR LANDSCAPE USE

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- 68 HERBS AND THEIR ORNAMENTAL USES
- 69 THE HOME VEGETABLE GARDEN
- 80 DESIGNING WITH FLOWERS
- 76 DRIED FLOWER DESIGNS
- 46 DYE PLANTS AND DYEING
- 72 NATURAL PLANT DYEING
- 58 MINIATURE GARDENS (*sink and trough gardens*)
- 101 ORIENTAL HERBS AND VEGETABLES

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- 90 HOUSE PLANTS
- 93 GARDENING UNDER LIGHTS
- 42 GREENHOUSE HANDBOOK FOR THE AMATEUR
- 53 AFRICAN-VIOLETS AND THEIR RELATIVES
- 81 BONSAI FOR INDOORS
- 54 ORCHIDS
- 43 SUCCULENTS

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- 75 BREEDING PLANTS FOR HOME AND GARDEN
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CONTENTS

Letter from the Brooklyn Botanic Garden	2
Flowering Dogwoods and Magnolias	Gordon Jones 3
Flowering Crab-apples	Milton Baron 8
Flowering Cherries	Clarence E. Lewis 15
Flowering Trees for Streets and Roadways	J. James Kielbaso 18
Lesser-Known Flowering Trees	Harrison L. Flint 22
Flowering Trees for Northern Landscapes	Douglas J. Chapman 26
Summer-Flowering Trees for Central and Northern Climates	Ruth Kvaalen 31
A Picture Selection of Flowering Trees	following page 36
Flowering Trees for the South	Fred Galle 37
Flowering Trees for the Very Deep South	Tom Sheehan 39
Rocky Mountain Region Flowering Trees	James R. Feucht 43
Flowering Trees for the Pacific Northwest	J.A. Witt 46
Conspicuous Flowering Trees in California	Philip E. Chandler 50
Flowering Trees for the Desert Southwest	Fred Widmoyer 54
Planting and Care of Flowering Trees	Kenneth D. Cochran 57
Designing with Flowering Trees	Robert E. Ford 61
Branching Structure, Forms, and Foliage	Clarence E. Lewis 65
Making Shrubs into Trees—A Matter of Style	Gary L. Koller 68
Arnold Arboretum Zone Map	70
Index—Vol. 39, 1983	71

*Cover photo "Bechtel Crab-apple" (*Malus ioensis* 'Plena') by Roche*

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LETTER FROM THE
BROOKLYN BOTANIC GARDEN

Trees can provide a canopy of shade in summer, brilliant color in the autumn, a sculptural structure in winter. And many are treasured for their flowers which add color, sometimes fragrance and, always, interest to the landscape.

What would spring be in Washington, D.C., without the flowering cherries in the Tidal Basin? The blossom-laden branches reflect in the water, doubling their visual impact. The effect is magical. And then—the wooded hills of New England with the white layered accents of dogwood. These lovely harbingers of spring are endangered now. Perhaps with consistent good weather, winter and summer, they may recover. At Brooklyn Botanic Garden magnolias are a visual delight in spring. Some have an abundance of flowers festooning bare branches in early spring while others blossom after leaves appear. Each spring seems more lovely than the preceding one. And if you live where snow falls, the contrast of dark limbed trees against the white background provides unforgettable shapes and forms.

Whether you want to plant one special flowering tree or many, you will find an abundance of ideas and facts within these pages.

Since 1945 Brooklyn Botanic Garden has been publishing the Handbooks with which you are familiar. George S. Avery began the series and even in retirement makes suggestions and comments that are always thoughtful and pertinent. Frederick McGourty for over fourteen years carried on the tradition with expertise, flair, and a keen wit. He set high standards.

Reflecting on my first year as editor of *PLANTS & GARDENS*, I find that it is the people who make these issues as distinguished as they are. Not only BBG staff, but the guest editors and contributors from around the world, whom we ask to write on their specialties, find time in their busy schedules to give of themselves, and to impart their knowledge to our readers.

It is to such a person that I turned for the first time in my tenure—a friend, respected colleague, and authority in his field, Clarence E. Lewis. He consented to be Guest Editor of this Handbook, bringing together a marvelous array of talented contributors. They span the country and bring up-to-date information on flowering trees for every landscape situation.

My thanks to Clancy for his good work, his friendship, and for opening my eyes to the wonders of tree structure, branch shapes, and bark textures. He has enlarged my vision and enriched my life.

To readers, my best wishes for good reading and good gardening.

Sincerely,



Editor

Although some articles are regional, some trees may be suitable for several areas. We suggest you leaf through articles for areas other than your own to see additional illustrations of trees for your particular area.



Southern or bull-bay magnolia (*M. grandiflora*)

FLOWERING DOGWOODS AND MAGNOLIAS

Gordon Jones

Dogwood (*Cornus florida*) is a small tree native to the eastern United States. It is normally 15 to 20 feet high, having a picturesque horizontal branching habit with blooms arising from swollen buds at the tips of short shoots. The four large showy white petallike bracts indented at their tips encircle the true flowers, insignificant greenish parts in the center. Cultivars available are *C. florida* 'Rubra', with red or pink bracts; *C. f.* 'Pluribracteata', a so-called double flowering form; *C. f.* 'Pendula', with stiffly weeping or pendulous branches; *C. f.* 'Welchii', its foliage strikingly variegated with green, creamy-white and pink, but a shy bloomer; *C. f.* 'Xanthocarpa',

which has yellow fruits. Recent horticultural selections or cultivars are 'Apple Blossom', with a blush of pink in the bracts; 'Barton', an improved large white, early blooming; 'Cherokee Chief', its bracts ruby-red; 'Cloud Nine', with large white bracts, blooming at an early age; 'New Hampshire', selected for winter-hardy buds; 'Springtime', a vigorous-growing white-flowered form.

A spring without our native dogwood bloom seems difficult to imagine, yet many have come to realize this possibility in Connecticut, Long Island, New Jersey, and Pennsylvania as countless numbers of dogwoods have contracted and



Native to Eastern America, dogwood (*Cornus florida*) is a graceful small tree of exceptional year-round charm, having excellent autumn color, good branching structure, and spectacular spring blossoms.

succumbed to what plant pathologists have named "lower branch dieback" caused by an anthracnose fungus, *Discula* sp. It attacks trees weakened from the stress of drought and severe winters. The cultivar *C. f. 'Rubra'* seems somewhat more resistant than the others. Experimental test results of a combination of fungicide spray applications, pruning of dead and dying wood and fertilization and watering during dry periods have given encouraging response in improved health of trees. We can hope the disease becomes less virulent and that Mother Nature provides adequate rainfall and favorable winters for dogwoods to recover and to flourish. There is no other tree that can replace in beauty the eastern flowering dogwood in blossom, in its autumn red berries and foliage colors, or in its winter aspect of branch tips with fat flower buds.

The Japanese or kousa dogwood (*Cornus kousa*) of Japan and Korea blooms about three weeks later than *C. florida* and after its foliage is well out. Its four creamy white floral bracts are pointed at the tips (not rounded and notched like *C. florida*), one to two inches long, often densely covering the leafy branches in a blanket of white. The fruit, which is fleshy, red and raspberrylike and attractive to the birds, follows in September. Its autumn foliage is a beautiful scarlet-red.

C. k. chinensis, of Chinese origin, may have slightly larger bracts but is otherwise identical. Variety 'Milky Way', a selection of *C. k. chinensis* is noted for profuse flowering; 'Summer Stars', a recent introduction, retains its flowers into the summer.

Happily, to date, kousa dogwood has been found to be resistant to the foliage disease problems and to the bark borer and crown canker that often affect *C. florida*. Kousa is more upright in branching, in contrast to the horizontal branching habit of *C. florida*. The flaky bark of kousa branches, as they mature, adds attractive winter interest.

Cornelian cherry (*Cornus mas*), introduced from Europe in the early 1800s, is admired for its profuse yellow flower clusters which appear in early April before the leaves. The short-stalked flower clusters have small yellowish bracts that drop as the flowers mature. These are followed in midsummer by smooth red cherrylike fruits, excellent for jelly, if gathered before eaten by birds. Often densely branched, the trees may reach 20 to 25 feet in height and are not susceptible to insects or diseases.

A similar species from eastern Asia is the Japanese cornelian cherry (*Cornus officinalis*), which is distinguished by an upswept habit of its branches and by having conspicuous tufts of hairs in the axils of the veins on the undersides of the leaves. Fruits and flowers are similar in both species.

Cornus coreana, a rarely seen dogwood from Korea, is well worth seeking, especially since *C. florida* has serious disease problems. It has a picturesque branching habit with persimmon-type bark and reddish-brown or purple branches. Flower clusters are flat, measuring up to three inches across, composed of a mass of tiny white flowers. The berries ripen bluish-purple, and leaves turn plum colored in the autumn. It seems to be free of insect and disease problems, is more tolerant of drought conditions and is an attractive tree growing to 20 feet at maturity.

There are several shrubby dogwoods valued for their fruits, their bright red autumn color, and some for their bright-colored twigs in the winter landscape. [See P&G Handbook #99, *A Nursery Source Manual*, for details—Ed.]

Magnolias

Among early spring-flowering trees, the magnolias are some of the loveliest. There are 80 species as well as countless varieties and cultivars; nine species are native to the United States, others are found in Mexico, Central America, the West Indies, and Asia. Unfortunately, not all are hardy in the north. In general, the Oriental species bloom before the leaves, whereas the flowers of the American species appear with the foliage. Most species are deciduous; a few are evergreen. Some of the Oriental magnolias have attractive hairy buds that unfold to reveal exquisite pink and white flowers with delightful fragrance.

The first to bloom and the hardiest of all the Asian magnolias is the Yulan (*M. heptaphala*), which in Chinese means lily tree. It is hardy as far north as Boston. Old trees often are 40 feet or more in height with spreading branches. The creamy white petals, nine in number, are almost fleshy and are indistinguishable from the sepals. Flowers are spectacularly large, bell-shaped and delightfully fragrant. The variety *M. h. purpureascens* has pink flowers inside with rose-red outside the petals.

The hardy saucer magnolia (*M. x soulangeana*), is the most widely planted of all magnolias in the northern states. A hybrid be-

tween *M. heptapeta* and *M. quinquepeta*, both Asiatic species, it was found in the garden of the Chevalier Soulange-Bodin at Fromont near Paris in the early nineteenth century. Flowers are bell-shaped, hardly resembling a saucer except when fully blown. They measure four to six inches across; sepals are half as long as the petals. Colors range from pinkish-white to rosypurple. Several named forms are available, the most popular being *M. x s.* 'Lennei', a late-flowering form with deep rose-purple petals. Other cultivars include *M. x s.* 'Alba Superba', compact, with white flowers lightly suffused with purple on the outside; *M. x s.* 'Alexandrina' flowers early, with blooms flushed with rosypurple to purple on the outside; *M. x s.* 'Brozonii', large ivory-white flowers with a tinge of purple at bases; *M. x s.* 'Grace McDade', giant rosypurple-colored petals, a very vigorous grower; *M. x s.* 'Lilliputian' has smaller flowers, white with purple bases, grown as a multi-stemmed shrub; *M. x s.* 'Speciosa' is late flowering with nearly white blooms.

The star magnolia (*M. stellata*) is the earliest to bloom and one of the hardiest Asiatic magnolias. The flowers have 11 to 21 white petal-like sepals and petals that are fragrant and often three-and-a-half to four inches in diameter. A shrubby tree, often broader than high, it is useful as a specimen as it branches full and to the ground. There are cultivars of merit worth seeking: *M. s.* 'Rubra' flower petals are fuchia-purple, the inside paler; *M. s.* 'Waterlily', petals are wider than the species; *M. s.* 'Royal Star', a seedling of 'Waterlily', has much larger flowers with up to 30 petals and sepals, an exceptional plant; *M. s.* 'Centennial', named for the Arnold Arboretum's hundredth anniversary, is reputed to be an improved 'Waterlily'.

M. kobus is closely related to *M. stellata* but differs in having white flowers with six to nine petals and three smaller sepals. It becomes a larger tree, 30 to 75 feet in height with broader leaves and does not bloom at an early age as does *M. stellata*. *M. kobus* var. *borealis* has larger flowers and leaves and greater size and vigor as well as being the hardiest of Asian magnolias. Old specimens can be found throughout New England and in Highland Park in Rochester, New York. Considered by many to be a hybrid between *M. kobus* and *M. salicifolia*, *M. 'Wada's Memory'* is a vigorous, fast-growing, floriferous tree with flowers two inches across, an outstanding hardy tree selected at the University of Washington

Arboretum from seeds received from Japan.

M. x loebneri (*M. kobus* x *M. stellata*) hybrids resemble *M. stellata* in habit with generally larger flowers, larger leaves and more vigorous in growth. *M. x l.* 'Merrill' was developed at the Arnold Arboretum in Boston. It is an excellent tree, erect, pyramidal and compact, up to 25 feet, and bearing hundreds of white fragrant starry flowers in April. Other fine cultivars of *M. x loebneri* are 'Ballerina', 'Leonard Messel', light pink, 'Spring Snow', a pure white, and 'Willowwood'.

The anise magnolia, (*M. salicifolia*), is also closely related to *M. kobus*. It is a narrow pyramidal tree up to 30 feet tall. When bruised the leaves and bark yield a pleasantly fragrant aroma of anise. Leaves are narrow, not over one-and-a-half inches wide, flowers fragrant, white, five inches in diameter with six petals blooming in mid-to-late April. This is an excellent early blooming magnolia which flowers at an early age.

M. sieboldii (*M. parviflora*) produces over a five week span of time white, fragrant cup-shaped pendant flowers, four to five inches in diameter with scarlet stamens. Shrubby in habit, it can be trained to a small tree.

M. hypoleuca (*M. obovata*), a native of Japan, is an outstanding foliage tree. Trees of 50 feet and larger are spectacular in foliage and flower. Leathery leaves grouped near branch ends are nine to 18 inches long and half as broad. Flowers appear in early summer and are very fragrant, creamy white, eight inches wide with a central cluster of bright purple stamens tipped with yellow anthers. It is a forest tree that is most unusual and a bold addition to the garden.

Other beautiful large-flowering Asiatic species, all flowering before new leaves appear, and all too tender for the north, include *M. campbellii* (Zone 8-9), *M. x veitchii* (Zone 7), *M. dawsoniana* (Zone 7), *M. sargentiana* (Zone 7) and *M. sprengeri* (Zone 7).

Native Magnolias

The cucumber tree (*M. acuminata*) is the northernmost and hardiest of our native magnolias. It is also the largest, growing under forest conditions ultimately to as tall as 90 feet. In the open, however, it develops a broader head with wide-spreading branches. Flowers are cup-shaped, greenish-yellow and not very conspicuous because they appear after the leaves are fully developed. The tree is best used for its foliage and habit. It grows vigorously.

Oyama magnolia (*M. sieboldii*), a native of Japan and Korea, produces cupped white blooms with deep red stamens over a period of several weeks.

The yellow cucumber tree (*M. a. var. cordata*) is smaller than *M. acuminata* in size, growing ultimately to 30 feet. Its flowers are cup-shaped, yellow, four inches in diameter and more conspicuous than those of *M. acuminata*. The leaves are slightly smaller, making it the preferred choice of the two for smaller places.

Magnolia 'Elizabeth' is an introduced hybrid of *M. acuminata* x *M. heptapeta*, developed by the Brooklyn Botanic Garden. It has become a much admired and sought-after plant as it has handsome, clear yellow, fragrant flowers. It is a vigorous grower and has the desirable hardiness of both parents.

The umbrella-tree (*M. tripetala*) is a large-leaved native of the Appalachian Mountains with leaves up to 20 inches long and wedge-shaped bases narrowed to short stalks. Flowers are creamy white with purple stamens, six to 10 inches in diameter and have an unpleasant odor. Attaining heights of 30 to 40 feet, it is striking in the landscape.

The large-leaved cucumber tree (*M. macrophylla*) has enormous glaucous leaves measuring up to 32 inches long, the largest of any native American tree. Native to the Carolinas it is hardy in southern New England. Flowers are huge and creamy white, reaching 14 inches in diameter in early July. It needs wind protection as leaves tear and break.

The sweet-bay (*M. virginiana*, *M. glauca* of the trade), a native of the coastal areas of the eastern United States, is semi-evergreen in the south, deciduous in the north and is a large shrub or occasionally a tree up to 60 feet. Very fragrant, waxy white flowers two to three inches in diameter continue to open from June through early summer. It can be grown in wet soils although it does not require damp areas to do well.

The Southern magnolia, or bull-bay (*M. grandiflora*) is one of the handsomest of evergreen flowering trees, and one of the few evergreen magnolias. A native of the coastal region



Rechsteiner

of the southeastern United States, the handsome evergreen foliage is retained through the winter. It is deciduous in the north and its hardiness is questionable much north of Washington, D.C. There are a few trees on Long Island that survive in very protected areas near water, sheltered from winter wind and sun. The bull-bay reaches 80 feet or more in the south. Leaves are large, thick, glossy above, rusty beneath and persistent throughout the year. Flowers are creamy white, delightfully fragrant, up to 12 inches in diameter, appearing in midsummer.

Magnolias grow best when provided with conditions much like their native habitat. They are basically woodland trees preferring a deep, fertile soil, not dry, but with good drainage. They resent drought, severe winds and poorly drained soil. Choose a planting site with adequate room to grow. They prefer sunny locations for overhead light, but appreciate the shade of other trees or structures to provide coolness for their roots.

In preparing for planting provide good drainage and incorporate generous quantities of humus, compost or peat moss, as magnolias are rich feeders and prefer a humus mix so their fleshy roots will make good growth.

Dry conditions can be extremely detrimental. Mulching after planting is therefore very beneficial and deep watering during dry periods is necessary. 



Arnold crab-apple (*Malus x arnoldiana*)

FLOWERING CRAB-APPLES

Milton Baron

Flowering crab-apples seem to surpass flowering cherries, magnolias and dogwoods in hardiness, habit of growth, color, and fruit. Today the array of crab-apples available in the trade seems without end. There are over seventy-five species, varieties and cultivars listed in nursery catalogues and more hybrids are being developed yearly. The number of new introductions can be confusing. Some have been evaluated thoroughly while others need more observation.

How To Choose

In order to make intelligent selections for land-

scape use certain criteria must be considered. The goal in selecting plants for a design situation is to utilize those providing the most positive assets for each season of the year. A plant possessing four seasons of usefulness is rated higher aesthetically over another having attractive qualities for but one or two seasons.

Consider the following qualities of crab-apples: *excellent flowering qualities*, singles and doubles in shade variations of white, pink, red and red-purple; *attractive foliage* of medium to fine texture in silvery green, dark green, reddish green, dark red, purple and bronze; *strong*

A highly regarded crab-apple since its introduction from Japan in 1862, *Malus floribunda* is deep pink in bud, paling in flower to white.

Riche

structural growth habit in numerous useful silhouettes and ultimate dimensions; *showy colorful fruits* in yellow, orange, pink, red and purple-red, well displayed and persistent when little other color is available as well as providing excellent bird forage in autumn and winter.

Other flowering trees, with the exception of the flowering dogwoods, can hardly be compared with the values inherent in the crab-apples.

The majestic flush of spring color, beautiful as it is, enhances our landscapes for only a brief period. However, the artistic qualities of form and structure remain to be enjoyed long after the blossoms and leaves have fallen. In crab-apples nature has provided a wide palette of shapes and line patterns. Basically these are: *low and wide* (Sargent crab); *narrow and upright* ('Van Eseltine' crab); *vase or "V" shape* (tea crab); and *picturesque and/or weeping* ('Red Jade' crab). Don't overlook leaf characteristics.

George Tallowin



Fortunately, there are no large coarse-leaved crabs. Compared to other deciduous trees, their leaf size is small to medium, fitting nicely into most landscape compositions. In color the spectrum is broad.

Culture

Crab-apples transplant with ease if moved when dormant and pruned properly. They succeed in most soils if adequate drainage and moisture are supplied. High fertility is neither necessary or desirable. For abundant flowers and fruits full sun is best. They will endure light shade at the expense of vigor, dense foliage and flowering. They are hardy and adaptable in zones 2-6, depending on the cultivar or variety. They are also candidates for planters or containers.

Crab-apples grow at a moderate-to-fast rate. Pruning is simple, even for the inexperienced. They can be grown naturally for dense screening, as open specimens by pruning, or trained

The red and yellow fruits of Japanese flowering crab-apple (*M. floribunda*) are borne on a densely-branched, rounded tree with small, refined foliage.

CRAB-APPLE INFORMATION CHART (Selected)

NAME	SIZE	GROWTH RATE	STRUCTURE	FOLIAGE	DISEASE RESISTANCE*	FLOWERS	FRUIT
'Adams'	20h x 20w Moderate	Rounded	Green with reddish tint	3	Single, red, buds open pink Abundant	Carmine red, $\frac{5}{8}$ " Persistent Abundant	
'Atrosanguinea'	20h x 20 w Moderate	Broad rounded	Greenish purple with a glossy surface	2	Single, red, 1 $\frac{1}{4}$ " Abundant	Yellow turning to brown and persisting as withered fruits. Abundant	
'Baskalong'	20h x 20w Moderate	Spreading, similar to Floribunda	Deep purple changing to bronze/green in summer. Reddish in fall.	2	Single, reddish-purple, 1 $\frac{3}{4}$ "	Dark reddish-purple with russet marks, 1 $\frac{1}{4}$ "	
'Beverly'	20h x 20w Moderate	Upright when young, more horizontal later	Small, light green	2	Dark red buds open to single white Abundant	Red, $\frac{5}{8}$ " Abundant	
'Bob White'	20h x 15w Moderate	Round head, dense	Green, fine texture	2	Single, white, 1" fragrant	Yellow to brownish-yellow, $\frac{3}{8}$ " Persistent	
'Brandywine T.M.'	25h x 20w Rapid	Vase-shaped then rounded	Green with purple tint, deep purple fall color	2	Double, deep-rose pink fragrant	Green, 1 $\frac{1}{2}$ "	
'Centurion'	25/30h x 20w Rapid	Vase shaped	Reddish green Good fall color	3	Single, rose red	Red, 1 $\frac{1}{2}$ " glossy Persistent	
'Coralburst'	6/8h x 8w Slow	Dwarf, shrublike	Dark green, small	2	Coral pink to rose, single—semi-double, $\frac{1}{2}$ "	Sparse, bronze, $\frac{1}{2}$ "	
'David'	12h x 12w Moderate	Compact, rounded	Green	2	Light pink buds open to white blooms	Scarlet red, $\frac{1}{2}$ " Persistent	
'Dolgo'	40h x 35w Rapid	Upright spreading	Green, glossy	3	White, 1 $\frac{3}{4}$ "	Red, 1 $\frac{1}{4}$ " early, good for jelly	

* 2 - average; 3 - better to excellent.

'Floribunda'	15/20h x 15/20w Moderate	Rounded, densely branched, arching, spreading	Dense, leaves are small, green	3	Carmine in bud opening to pink and fading to white, 1-1½", profuse	Yellow/red, ¾" not snowy
'Harvest Gold'	18h x 8/10'w Rapid	Upright, oval	Green	3	Single, pink bud, white	Golden yellow, ¾" Persistent
'Henry Kohankie'	20h x 20w Fairly rapid	Rounded, open	Green	3	Pink buds open to white flowers Single, 1¼"-1½"	Red, 1¼"-1½", glossy Elliptoidal, good for jelly. Persistent
'Indian Magic'	20h x 20w Moderate	Rounded	Dark green	2	Rose red, 1½"	Glossy red to golden orange, ½" Persistent
'Liser'	15/20h x 12w Moderate	Upright or columnar	New growth red/maroon, dark green later	2	Single, buds dark crimson with rose crimson, 1½"	Dark red/crimson, ½"-1" Too dark to be showy
'Mary Potter'	12/15h x 10w	Horizontal and low spreading vase-like	Dark green	2	Buds pink, flowers white, 1"	Red, ½" Persistent
'Pink Spires'	15h x 10w Moderate	Narrow, upright	Reddish purple	2	Single, pink	Reddish-purple, ½"
'Radiant'	15/20h x 15/20w Rapid	Broad, medium sized	Red/purple when young, aging to green	2	Single, buds deep red, flowers deep pink	Bright red, ½" Fruits develop color in mid-summer
'Red Jade'	15h x 15w Moderate	Graceful, slender weeping branches, elegant habit, picturesque	Glossy, vibrant green	2	Single, medium white, 1½" profuse	Red, bright, showy egg-shaped Persistent
'Red Silver'	20/30h x 15w Rapid	Branch tips tend to droop. Graceful	Reddish-bronze silvered with silvery hairs	2	Single, china rose to deep red, 1½" diameter	Purplish-red, ¼" good for jelly
'Red Splendor'	18h x 18w Rapid	Open, graceful	Reddish dark green, clean and disease resistant in most areas	3	Buds rose, opening to single pink	Red, ¾" Persistent Keeps color well

NAME	SIZE	GROWTH RATE	STRUCTURE	FOLIAGE	DISEASE RESISTANCE*	FLOWERS	FRUIT
'Sargentii'	6/10h x 8/14w Slow	Dense, low oval; picturesque	Dark green	3	Profuse, fragrant 1/2" small, usually white but there is a pink cultivar	Dark red, small 1/4-1/3" profuse Persistent	
'Selkirk'	20h x 20w Moderate	Upright, spreading with age; vase shaped, rounded	Glossy reddish- green changing to dark greenish- bronze; very attractive	2	Single, deep purplish pink, 1 1/2"	Very glossy, 1/4" bright red, fruits early Abundant	
'Sugar Time'	20h x 15/20w Fairly rapid	Upright, oval	Green	3	Single, white, 1" Fragrant	Intense red, 1/4-1 1/6" Showy Persistent	
'Weeping Candied Apple'	16h x 10w Moderate to rapid	Horizontal to pendulous	Heavy dark green with red	3	Single, 1" purplish pink	Cherry red, 3/8"	
'White Angel'	15/20h x 15/20w Moderate	Rounded	Glossy green	2	Single, buds pink opening to white	Scarlet red, 1/2-5/8"	
'White Candle'	14h x 5/8w Moderate	Columnar when young, vase shaped later	Green	2	Semi-double, pink buds, white bloom	Red, 5/8" sparse	
'Winter Gold'	20h x 20w Moderate	Rounded	Green	2	Carmine buds, single white flowers 1", late late season bloomer	Outstanding, 1/2" yellow with orange or pink Abundant	
'Donald Wyman'	20h x 20w Moderate	Rounded	Medium green, smooth & clean	3	Pink buds, white single flowers, 1 1/3", abundant	Glossy, bright red, 3/8" Abundant Very persistent	
<i>M. zumi calocarpa</i>	25h x 15w Moderate	Dense, upright, oval. Branches tend to droop or spread	Medium leaves, dense canopy	2	Buds red, flowers white, fragrant, pinkish 1 3/8" abundant	Bright red, glossy, Small, 1/2", excellent dependable tree Abundant Persistent	



Heavily laden boughs of an old yet healthy tea crab (*Malus hupehensis*), a tree essentially vase-shaped with long, arching branches.

as espaliers when grown on dwarfing understock.

What should be looked for in a nursery plant?

It must be well branched and symmetrical. Further, the plant should not have unhealed bark wounds, cracked or broken branches or evidence of insects or disease. Growers produce plants in bare-root sizes, and potted in sizes three to five feet high or as balled specimens from five to ten foot size, while more mature plants are dug with a tree-spade mover. Some nurseries produce low crowned plants with a single stem 12-15" high before branching begins. This form may be utilized where there is to be an underplanting. Many of artistic mind believe the most interesting plants are grown multi-stemmed or bush form, with two, three or more stems or trunks which make an appealing clump in age, rather

than a single trunk that will resemble an orchard tree at maturity.

Although insects and diseases may affect them, Oriental crab-apples and some of their hybrids are generally less apt to suffer. Use disease-resistant crab-apples, of which there are many, whenever possible. Disease severity varies yearly depending on the rainfall frequency and springtime temperatures. Application of fungicidal sprays in early spring before infection reactivates should control rust and scab. Fire blight prevention and control requires good sanitation and vigorous pruning.

Although easy to detect, suckering, a widespread problem, can be devastating when neglected. Suckers or basal sprouts may appear below the graft joint at the ground line around

the trunk. These originate from the root stock, selected for vigor, not appearance, and they can take over the plant. Pruning the young sprouts flush with the trunk after the soil is pulled back is the remedy; getting at them early is the trick. Suckering can virtually be eliminated by planting the tree somewhat deeper (the bud union three inches or more below grade) than usually suggested for most trees. Deeper planting stimulates roots, not shoots, from the understock.

A clump-form tree can be developed by planting a single stem plant of the proper variety not over one inch caliper and pruning off the stem two to three inches above grade and painting the stub. In the first season, under good conditions, several stems, 24-36", will develop. These should be pruned leaving the best-spaced three to five stems. By the third growing season your clump tree should be shoulder high, and much more interesting than a single-trunk tree.

A design potential overlooked by nurserymen is the possibility of different growth habit of weeping crab-apples. Presently, weeping 'Candied Apple' and 'Red Jade' crab-apples come only in straight-stem trees from 4-6' tall and are not picturesque until weeping side branches and crowns develop. If these clones were not staked they would grow into irregular, sprawling, mounded plants with a natural, picturesque quality, useful in planters, on banks and cascading over retaining walls. Using the same procedure as for growing trees of clump habit, you can create your own. Though it takes time, the result would be a joy to those who savor picturesque plants.

Another dividend available from crab-apples are the colorful fruits during late summer, and, in some cultivars, throughout the winter. Migratory songbirds and permanent winter residents find ripening crab-apples a nutritious source of food. Cedar waxwings, robins, pheasants, and others will stay until the fruit supply is depleted. The smaller, brightly colored fruits (1/4-1/2" diameter) seem to attract the birds. After freezing weather sets in, the large fruits (3/4" and over), regardless of color, are relished for the remainder of the winter. Some birds take only those fruits on the trees, while others are not fussy, feeding on the fallen fruit on the ground as well.

Remember that crab-apples are relatively long lived—twenty-five or more years—so the time spent analyzing the design requirements and selecting the cultivars will pay seasonal aesthetic dividends for a long time.

Editor's Choices:

Broad oval crown

- M. 'Adams'
- M. *atrosanguinea*
- M. 'Donald Wyman'
- M. *floribunda*
- M. *zumi calocarpa*

Vase shape, picturesque

- M. *hupehensis*

Weeping, picturesque

- M. 'Red Jade'
- M. 'Weeping Candied Apple'

Low, wide, picturesque

- M. *sargentii*
- M. 'Mary Potter'

Narrow, upright

- M. 'Centurion'

Persistent fruit

- M. 'Henry Kohankie'
- M. 'Sugar Time'

Red-purple foliage

- M. 'Liset'

Excellent white flowered

- M. 'Donald Wyman'
- M. 'White Angel'

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Prunus serrulata 'Fugenzo', an Oriental flowering cherry

FLOWERING CHERRIES

Clarence E. Lewis

Japanese flowering cherries first arrived in this country more than two hundred years ago, and today their popularity is still undiminished. The most prominent ones, noted for their abundance of colorful flowers, are the Oriental, or Japanese, flowering cherry, *Prunus serrulata* and its many varieties and cultivars; Higan cherry, *P. subhirtella* and its varieties and cultivars; the Yoshino cherry, *P. yedoensis*; and Sargent cherry, *P. sargentii*. They are all from Japan, China or Korea.

The Oriental or flowering cherries deserve a better fate than has often been their experience in this country. They are not rugged trees, as are many of our native cherries, and are often misused by being planted in wet areas, or where

there are periods of extreme heat or cold. A well drained fertile soil, along with other favorable growing conditions, is required.

The Japanese Flowering Cherry

No trees produce a greater multitude of flowers than some of the cultivars of *Prunus serrulata*. 'Kwanzan' (also listed as 'Kanzan') is the most commonly used in the landscape. One reason for this is that it can be found easily in local nurseries. The unscented, double pink flowers are produced in great numbers during late April or early May in East Lansing. The form is V, or vase-shaped, broadening as it matures. 'Fugenzo' has a similar flower presentation, but a broader, more spreading form. 'Shirotae' ('Mt.



Few spring sights are as breathtaking as the sight of weeping Higan cherries (*Prunus subhirtella* var. *pendula*) with arching cascades of single pale pink blossoms.



The Cherry Walk at Brooklyn Botanic Garden in early May with 'Kwanzan' cherries in full bloom.

Paul Frese

Fuji') willingly exhibits its fragrant, pure white semi-double to double flowers, and a broad appearance. It does better in zones 4-5. 'Amanogawa' is the most upright, and displays a very narrow form, exhibiting fragrant, light pink semi-double flowers. As it matures, it may be necessary to tie the branches in order to maintain this outline. 'Ukon' is quite different, with its semi-double, pale yellow flowers, contrasting well with 'Kwanzan' or 'Fugenzo'. All display an orange-red autumn foliage coloration, plus an attractive dark reddish bark with well-defined lenticels.

The Yoshino and Higan Cherries

The Yoshino cherry, *P. yedoensis*, is the most prominent species in the Tidal Basin in Washington, D.C. Some believe this to be the showiest of all the cherries, being heavily laden with single, pale pink-to-white fragrant flowers. It is for areas with moderate winters. 'Akebono' is a hardier selection. It has translucent pink flowers, and has been grown in East Lansing, Michigan, without serious winter injury.

The Higan cherry, *P. subhirtella*, is best known for two well-known selections. 'Pendula', a pronounced weeper, has pendulous branches that may originate from different levels on the main trunk. Pale pink flowers appear in early spring on these lazy, hanging branches, and produce a magnificent display. It flowers easily, even in the colder parts of our country, providing a graceful show that can move even the most casual observer. 'Autumnalis' is not noticeably

different from the species, except that sparse repeat flowering occurs during warm fall periods.

The Sargent Cherry

A flowering cherry warranting greater use is the Sargent cherry, *P. sargentii*. It has fewer of the problems common to cherries and produces rose pink, single flowers in spring. It is a most acceptable tree for providing shade near a patio. The cultivar 'Columnaris' is quite narrow and matures to an oval head. The bark is reddish, and a very effective red-to-bronze autumn foliage color adds immeasurably to the appeal of this lovely tree.

A very interesting project called "Seeds of Friendship" is being carried on by Roland Jefferson at the National Arboretum, Washington, D.C. One million seeds of our native flowering dogwood, *Cornus florida*, have been sent to Japan in exchange for one million seeds of their flowering cherries. This is being encouraged and coordinated by Dr. Jefferson, and the purpose is to find and breed different types of flowering cherries that will survive the rugged American climate. In Japan the project should provide a much greater number of native American flowering dogwoods. The seed collecting in both countries has been done by students.

Someday there may be many new flowering cherries in this country as well as dogwoods in Japan. Trees, as nothing else, are a common bond that may accomplish something which diplomats only hope to do. ♫



Chinese scholar tree (*Sophora japonica*)

FLOWERING TREES FOR STREETS AND ROADWAYS

J. James Kielbaso

Historically, most American streets and highways were planted with large-growing trees, principally for shade. As of 1980, the most frequently planted trees along streets in the United States were maple, oak, elm, sycamore, linden and ash. At the same time, the most frequently planted trees were maple, linden, honey locust, ash, flowering pear and crab-apple. The only other flowering trees in the top fifteen in their respective regions of the country were Kwanzan cherry and mountain ash in the Northeast; dogwood and crape-myrtle in the South; and

magnolia and crape-myrtle in the West. The larger growing trees were more commonly planted, especially Norway and other maples. At a time so soon after the demise of the American elm as the dominant street tree, it is surprising to observe such great reliance on the maples as a group. In order to avoid problems with street trees from insects or diseases, various recommendations have been proposed to limit planting. One suggestion was that no more than 10 percent of any genus or 5 percent of any species be planted in an area.

When asked to choose from photographs, residents still prefer large trees, although flowering trees receive high praise. Flowering trees, however, are usually small, but they are also easier to maintain and have fewer utility conflicts. These two advantages suggest a more extensive use of flowering trees along roadways. Flowering trees are not problem-free, and some are actually high maintenance, but their overall advantages outweigh disadvantages and carefully chosen flowering trees should have a prominent place in the landscaping of our streets and roads.

Some of the Best

There are a good number of flowering trees to choose from, some rather common, like the cherries and crab-apples, and others less common, such as pagoda tree, and golden-rain tree.

The best and toughest flowering trees are the cultivars of callery pear (*Pyrus calleryana*). Several cultivars have been introduced by the USDA and the National Arboretum. The standard of comparison is 'Bradford', which has been widely planted because of its excellent shiny, dark green foliage which turns crimson in late autumn, and often persists into December. The white flowers are showy in spring. Many fine streets have been planted with Bradford callery pear in the Washington, D.C. suburbs and other cities around the country. New introductions to consider include 'Redspire', 'Whitehouse', and 'Aristocrat'. The pears are so valuable an addition that caution must be exercised to avoid overuse of this tree.

Another very useful tree is Chinese scholar tree or Japanese pagoda tree (*Sophora japonica*). This tree comes alive with creamy-white blossoms during late summer when no other trees are flowering. The cultivar 'Regent' has been acclaimed for its rapid growth, good form, pest resistance, handsome foliage, and flowers—a tree well worth considering.

The golden-rain tree (*Koelreuteria paniculata*) provides conspicuous yellow flower clusters in early summer. It is another tree that flowers in late June and July and can provide a unique display. Although the autumn color is not impressive, the light brown pods resembling Chinese lanterns provide interest for several more months. It does not grow to a large size, and is tolerant of a wide range of soils, although its durability has been questioned.

For spring show, few trees can compete with the flowering cherries, especially Oriental cherry (*Prunus serrulata*). It is normally pruned

as a five or six foot standard. The double, deep pink, profuse spring flowers are spectacular and in the autumn the leaves become an orange-red. 'Shirofugen' and 'Mt. Fuji' are good selections of this species for streetside use, as is the columnar 'Amanogawa'.

The Higan cherry (*P. subhirtella*) has the cultivar 'Autumnalis' which is similar in size and shape to Oriental cherry, though not as striking in form. This tree will often bloom during a warm autumn, even though its semi-double, light pink flowers are more numerous in the spring.

The Yoshino cherry (*P. yedoensis*) with its fragrant, white-to-pink flowers, shares the Washington cherry-blossom display with Oriental cherry, and will also serve as a street tree.

The Mazzard cherry (*P. avium*) has a cultivar, 'Scanlon', which is usually on a seven-foot-high trunk and reaches only 14 feet, making it an excellent choice under low wires. In fact, most of the above-mentioned cherries range from 20 to 30 feet, and will fit under most wires.

Hillier spire cherry (*P. hillieri* 'Spire') is a narrow, upright cherry, one of the earliest to flower. The columnar Sargent cherry, (*P. sargentii* 'Columnaris') is another fine choice for narrow locations. Because of their beautiful flowers, the cherries offer a great potential, and new varieties, such as 'Accolade', will be introduced from time to time and be worthy of trial.

For accent, the purple-leaved plums offer interest. They are small-statured and flower rather heavily. Among the plums, some of the best to consider are: *Prunus cerasifera* 'Thundercloud', 'Newportii' and *P. x blireiana*. In several cities in Europe, I have seen those purple-leaved trees alternated with similarly shaped, but green-leaved flowering crab-apples or cherries. The contrasts are striking and they are valuable because they provide interest when not in flower.

More for Street Plantings

Hawthorns have much to offer, as well as lessons to teach us. Paul's Scarlet and Lavalle hawthorns were once "the" choices. Paul's is not highly recommended today owing to pest problems, even though improved cultivars may be recommended. Although some choose Lavalle hawthorns, others have had poor results. No tree is "right" everywhere.

Several hawthorns are appropriate for street planting: Washington hawthorn (*Crataegus phaenopyrum*); Lavalle (*C. x lavallei*) in many places; Winter King (*C. viridis* 'Winter King'), less thorny than most, Crimson Cloud (*C.*



Hardy, striking, and of a manageable size, the Japanese tree lilac (*Syringa reticulata*) has the bonus of fragrant creamy flowers.

laevigata 'Superba'), related to Paul's Scarlet but more disease resistant; Pyramidal Singleseed (*C. monogyna* 'Stricta'); and the rather new Ohio Pioneer dotted hawthorn (*C. punctata* 'Ohio Pioneer') which is thornless. The hawthorns, in nature, grow in some of the most difficult, dry conditions, but benefit in cultivation from improved conditions.

No discussion of flowering street trees can be

complete without considering the crab-apples. There are so many excellent crab-apples to choose from that a list can be neither complete or adequate. Unfortunately, many varieties are susceptible to one or more of three major problem diseases (apple scab, fire blight, and powdery mildew), not to mention aphids and other insects. Before selecting, you should consult the local extension specialists or state agricul-

tural experiment station for cultivars that are disease resistant in your area. Susceptibility varies from region to region. Since it is natural for some to flower every other year (alternate bearing), it is usually best to avoid these alternate bearers and select annual flowering varieties. Many crabs have been selected for profuse annual flowering and for colors from red and pink to white, as well as growth form. For streets, the more upright selections are usually best.

It is impossible to provide an accurate listing of crabs to select from, so only a few will be noted, with the strong suggestion that any planner/planter should consult local experts. Of the crab-apples, several that may be suggested are: Snowdrift (*Malus* 'Snowdrift'), round-headed with white flowers; 'Radiant' (*M.* 'Radiant') upright with red flowers and scab resistance, Siberian crab (*M. baccata*) a large tree with profuse white flowers, with an upright cultivar available. Three recent double-flowered cultivars are worthy of trial: *M.* 'American Beauty', with red flowers; *M.* 'Pink Perfection'; and *M.* 'Snowcloud'. [See pp. 8-14 for more about crab-apples—Ed.]

Another tree with excellent potential for limited use is the Japanese tree lilac (*Syringa reticulata*) which can be trained to grow on a single stem. It has large clusters (panicles) of fragrant creamy white flowers in June, and a cherrylike bark. It reaches only 20 to 25 feet high, and is very hardy, growing well in Manitoba.

Mountain-ash (*Sorbus* spp.) deserves some attention. The European mountain-ash (*S. aucuparia*) has been used successfully in many places near roadways, and provides summer flowers followed by attractive autumn fruit. Korean (*S. alnifolia*) and oakleaf (*S. x thuringiaca*) both offer excellent displays. The oakleaf has a columnar cultivar, 'Fastigiata'.

For wider tree lawns or boulevards, the American redbud (*Cercis canadensis*) produces early flowers which precede the leaves. The flowers are usually red to pink, but there is also a white redbud available, especially for those who like contradictory terms. The white buds and flowers are quite showy.

In many areas, the flowering dogwood (*Cornus florida*) is "the" flowering street tree. It does not do well along streets in the northern part of its range. However, in cities in the south it is frequently planted. It may well be that this is one tree which must be selected from more northern seed sources than is currently being

done. Early results of a dogwood seed source study indicate, at least for Michigan, that seed from Michigan, Ohio, and Pennsylvania is most desirable.

Yellowwood (*Cladrastis lutea*) is a tree with excellent potential. It is hardy in most of our northern states, with fragrant, pendulous, late spring flowers and a very nice beechlike smooth bark.

Another smooth-barked tree with excellent possibilities is the shadblush or Juneberry (*Amelanchier canadensis*) which is also known by several other common names. It is one of the earliest trees to bloom, having attractive white flowers. Its autumn color ranges from yellow to red. A new improved cultivar is *A. x hybrida* 'Cumulus' with slightly more conspicuous flowers and a more upright form.

A final group to consider are the horse-chestnuts, (*Aesculus* spp.). The ruby-red horse-chestnut (*A. x carnea* 'Briotii') produces large clusters of scarlet-red flowers with sparse fruiting. It seems to have a hardiness problem in Lansing, Michigan, but does quite well in many other areas. The Baumann horse-chestnut (*A. hippocastanum* 'Baumannii') has beautiful double-white sterile flowers and no fruit. It does well in the Lansing area. Both of these horse-chestnuts should be given more space than many of the smaller flowering trees.

Other trees such as maackia, magnolia, and flowering ash also merit attention. In fact, some of our shade trees, including Norway and red maples, linden, and tulip tree, warrant attention as flowering trees, but will only be mentioned in passing. This discussion has centered mostly on northern species, but examples of Southern magnolia are beautiful, grown on the White House grounds, and may be seen on the back side of our twenty-dollar bill. Crape-myrtle is grown as a tree in the south. In the subtropical south the royal poinciana, or flamboyant, has almost breathtaking flowers; it is used as a street tree in many tropical countries.

Fruiting Trees

Tree fruits may produce effects almost as showy as flowers. Consider for example the fruit covering linden in September, or the fruit pods of koelreuterias, so much resembling golden Chinese lanterns, or the flowerlike red samaras of Amur maple.

There is an opportunity to diversify and beautify our streets and roadways. What is needed is effective planning. 



Chinese fringe-tree (*Chionanthus retusus* var. *retusus*)

LESSER-KNOWN FLOWERING TREES

Harrison L. Flint

It seems paradoxical at a time when flowering trees have reached a peak of popularity in the United States that some of the most interesting are unknown to most gardeners. Some flowering trees have failed to become popular because of problems in commercial propagation and production. Others have not been adopted because there was no pre-existing need for them, and still others because they simply have not been known. Given a little publicity, the help of modern propagation techniques, and a little time, some of these may find their way into commercial listings.

The following flowering trees are all little-known, but promising. They constitute only a sample of the total number of lesser-known flowering trees, but still a group of distinctive and potentially useful trees that deserve a closer look.

Chinese toon or Chinese cedar (*Cedrela sinensis*). This is the most cold-hardy member

of the mainly tropical Mahogany Family, succeeding in Zone 5. Mature trees in Swan Point Cemetery, Providence, Rhode Island, have grown to a height of about 35 feet since they were planted there in the 1930s.

Chinese toon has very large compound leaves, often 18 inches long and with as many as twenty leaflets, superficially resembling those of the tree-of-heaven (*Ailanthus altissima*). That is where the resemblance ends; Chinese toon leaflets lack the obvious glandular teeth and rank odor of *Ailanthus*. They have a mild oniony smell and taste, and where the tree grows wild in China, succulent young shoots are eaten.

In some areas, foliage of Chinese toon is moderately colorful in spring and autumn. The new leaves are pink as they emerge. In maritime climates, where the seasons develop slowly, the pink stage may be followed by a creamy-white stage before chlorophyll forms, turning the

leaves green. In autumn, the foliage turns a delicate yellow in some areas and years.

The most obvious seasonal interest comes from the lightly fragrant, bell-shaped flowers—individually very small but borne in large numbers in loose pendulous foot-long clusters. The overall effect is white, sometimes with a slightly lavender tint.

Trunk and branches of *Cedrela* are covered with a coarsely shaggy gray bark that peels off in rather long strips, presenting both an added attraction and a litter problem—perhaps not a serious one for many gardeners. When seeds form, they may give rise to weed seedlings. Unlike the seeds of tree-of-heaven, which are winged and carried some distance by the wind, Chinese toon seeds usually fall close to the parent tree, and resulting weed seedlings are easy to eliminate.

Chinese fringe-tree (*Chionanthus retusus* var. *retusus*). This impressive flowering tree from China has been upstaged for years by its North American relative, the white fringe-tree (*C. virginicus*), and more recently by its Taiwanese counterpart, *C. retusus* var. *serrulatus*. The few plants of this variety that can be seen in North American collections are very different from both relatives, especially in growth habit.

C. retusus is less showy in flower than *C. virginicus* but, as if in compensation, more interesting in landscape form. Var. *serrulatus* is gradually becoming known for its low-branching growth habit and handsome exfoliating bark. Var. *retusus*, on the other hand, has tighter, furrowed bark and higher branching, which leaves no doubt that it is a tree rather than a shrub. A mature tree at the Arnold Arboretum vaguely resembles a miniature American elm at a height of about 20 feet.

Like many other trees, this one does not flower heavily every year, but in good years it provides an impressive mass of white flowers later than those of *C. virginicus*, but still in early summer. The blue-black fruits that follow on pistillate (female) trees are somewhat smaller and less showy than those of *C. virginicus*. This variety's ascending branches make it an ideal tree to sit beneath, and it can be counted on not to outgrow most patio situations. This particular form does not seem to be available commercially at present, but it represents an opportunity for a commercial propagator interested in new and different landscape plants.

Dove tree (*Davidia involucrata*). This tree is a Chinese member of the Tupelo Family, which

includes black or sour gum (*Nyssa sylvatica*), native to eastern North America. Showy papery-white bracts surrounding clusters of flowers appear in late spring. It has large, sharply toothed leaves. The dove tree bears little superficial resemblance to *Nyssa* except for its strongly horizontal branching.

Older trees in the eastern United States have reached heights of 40 feet and somewhat taller trees can be found in the Pacific Northwest and Europe. Dove tree is generally cold-hardy to Zone 6, making it useful on Long Island and in coastal southern New England in the Northeast, and from Kentucky to southeastern Missouri in the Midwest.

Plants of the variety *vilmoriniana* differ little from those of the species type except that they may be slightly more cold-hardy. Trees growing successfully at the Arnold Arboretum (Zone 5) have been assigned to this variety, but the existence of two separate varieties is not acknowledged by all botanists.

Dove tree is a useful lawn shade tree with little landscape interest other than its pyramidal, horizontally branching form and spectacular floral bracts. It has so far been trouble-free but, like other trees mentioned here, it needs to be used more widely before its susceptibility to problems can be fully assessed.

Chinese parasol tree, phoenix tree, Japanese varnish tree (*Firmiana simplex*). This native of warm-temperate southern China and Taiwan is a member of the mostly tropical Sterculia Family, and has a decidedly "tropical" appearance with its smooth trunk, strongly whorled and stratified branches, and large, palmately lobed leaves.

In spite of its appearance this tree is fully hardy northward at least to Zone 8 and functionally hardy in at least some sites in areas as much as 10°F colder (Zone 7) from Washington D.C. to Memphis, Tennessee. It grows best in full sun in well-drained but reasonably moist soil. Protection from strong wind is advisable to reduce damage to foliage.

Flowers of Chinese parasol tree open greenish or creamy-white in midsummer. They are small but arranged in rather showy clusters sometimes 18 inches long. The small green-to-brown capsules that follow are not showy, but interesting at close range since they open after flowering and display the black, pea-size seeds in autumn.

The trunk, covered with smooth light-green bark, and the strikingly whorled branches give



Dramatic bracts surround the flowers of the dove tree (*Davidia involucrata*), a Chinese relative of our native tupelo (*Nyssa sylvatica*).

this tree its landscape interest. Once established its fast growth (two to three feet a year) makes it a good choice as a temporary patio tree, but care must be taken to place it where it has plenty of room since in a good site it can quickly become a rather large tree.

Since Chinese parasol tree has not been widely used, it may have weaknesses that are not yet apparent. For now, it is a distinctive flowering tree with much greater interest than its flowering alone, and few if any problems—a functional and beautiful shade tree that bids for greater attention from the homeowner and the professional landscaper.

Fragrant snowbell (*Styrax obassia*). Small trees with fragrant flowers are not so common

as to be taken for granted. Fragrant snowbell is such a tree and one of the most elegant of small trees in other ways. Its flowers are accompanied by much larger leaves than those of so-called Japanese snowbell (*S. japonicus*) (both species are native to Japan, *S. japonicus* to China as well). In fact, the leaves are so large that they partly hide some of the flowers.

The leaves do not change color appreciably before falling, but the tree remains interesting throughout the year because of its smooth, dark gray bark on finely molded trunks and branches, very similar to that of *S. japonicus*. The growth habit of *S. obassia* is very different from that of *S. japonicus*, however. While that tree is wide spreading, with horizontally stratified foliage

and flowers, *S. obassia* is much more upright in branching and narrow in form, which is an advantage where lateral space is at a premium. Both species can be expected to remain below 25 to 30 feet tall, but *S. obassia* will also stay within 20 feet in width, while *S. japonicus* may spread to twice that.

These two snowbells are about equal in cold-hardiness to Zone 6 and favorable microclimates in slightly colder areas. Useful southward to Zone 8, nearly to the Gulf Coast, they are only moderately tolerant of drought and poorly drained soils.

Shinyleaf yellowhorn. (*Xanthoceras sorbifolium*). This shrubby tree has much in common with its relative in the Soapberry Family, golden-rain tree (*Koelreuteria paniculata*). Like *Koelreuteria*, *Xanthoceras* is a small tree with interesting compound foliage, native to China, and adapted to hot, rather dry climates. Unlike *Koelreuteria*, its foliage is glossy and dark-green, persisting late into autumn, and its snowy white flowers with crimson centers appear in mid-spring instead of midsummer.

Genetic material of *Xanthoceras* presently cultivated in North America is less hardy than the hardiest plants of *Koelreuteria*, but satisfactory northward to Zone 6 and favorable

microclimates in slightly colder areas, and southward to the Deep South. Mature trees in Missouri Botanical Garden, St. Louis, are about 15 feet tall and notably drought-resistant. They make an impressive show when they flower in April.

Availability

By definition, "lesser-known" trees will also be less available than more common ones—a problem for landscape architects, landscape contractors, retailers, and homeowners alike. It does little good for a landscape designer to specify a plant that cannot be obtained, for a garden center manager to stock a plant that is so unfamiliar to gardeners that few will buy it, or for a nurseryman to propagate a new plant without simultaneously promoting it to landscape architects and contractors, and to the general public.

Perhaps part of the answer is for garden writers, landscapers, architects, merchandisers, and users of landscape plants to call each other's attention to promising new trees and shrubs. For members of all of these groups to do this would surely result in greater acceptance and use for at least a few of the most promising lesser-known landscape plants. 



The foamy snow white, crimson centered flowers of shinyleaf yellowhorn (*Xanthoceras sorbifolium*) contrast dramatically with the dark green, glossy compound foliage.



FLOWERING TREES FOR NORTHERN LANDSCAPES

Douglas J. Chapman

Flowering trees for northern landscapes can be divided into three groups—trees native to northern North America; trees native to western Europe; and trees native to Asia. Also to be considered are flower color, flower shape, period of bloom, typical habit of tree growth, ultimate size, and use.

The first group of plants to be considered are those native to northern North America. They are usually better adapted, will withstand the rigors of the weather from Northern Michigan to Central Ohio and east throughout New England, New York and New Jersey. The fol-

lowing selection is listed alphabetically.

Red maple (*Acer rubrum*). Red flowers, early spring during late March. Upright habit of growth, 80-100' at maturity. Particularly effective as a specimen tree in parks and large-area landscapes. Can be brittle.

Striped maple (*Acer pensylvanicum*). Yellow chainlike flowers appear early, before the leaves, during April. The shape is an upright-oval, ultimately reaching 30-35' in height. It is particularly effective in naturalized areas for parks and the home landscape. Good in groups of two or three.

Tulip-tree (*Liriodendron tulipifera*) has large creamy, cuplike flowers, sometimes tinged with pale green, touched at the base with mango orange.

Ohio buckeye (*Aesculus glabra*). Pale yellow pyramidal clustered flowers appear in early May. At maturity it is a rounded tree, 30-40' in height.

Shadblow (*Amelanchier arborea*). White flowers early in the spring, before the leaves. It is a 35' tree with upright-oval habit. *A. x grandiflora*: large white flowers before the leaves appear. Can be a multiple-stemmed or small, single-stemmed tree, reaching 25' in height. *A. laevis*: smaller white flowers, appearing in early spring. It reaches 35'. All amelanchiers are very effective in home landscapes.

Northern catalpa (*Catalpa speciosa*). White flowers in midsummer. This 90-100' tree has an upright-irregular habit.

Redbud (*Cercis canadensis*). Magenta, pea-shaped flowers, prior to leaves (mid- to late-May). Its rounded habit of growth reaches 25-35'. *C.c. 'Wither's Pink Charm'*: pink flowers. *C.c. alba*: white flowers. As specimens they are effective in almost any landscape.

White fringe-tree (*Chionanthus virginicus*). White, featherlike flowers, during June. This 25-30' round small tree can be effective in home landscapes.

Yellowwood (*Cladrastis lutea*). White pendulous clustered flowers, appearing in late spring. The mature 40-50' tree has a somewhat rounded habit. It is effective for home or park landscapes.

Pagoda dogwood (*Cornus alternifolia*). Small white flowers, appearing in late May. This small 20-25' tree has a layered upright-oval habit, effective in mass plantings.

Flowering dogwood (*Cornus florida*). White flowers which appear before the leaves during May. This sympodial, yet rounded, tree reaches 35-40' in height. *C.f. 'Alba Plena'*: twice the normal number of white bracts. *C.f. 'Cherokee Princess'*: large white bracts. *C.f. 'Springtime'*: large white bracts. *C.f. rubra 'Cherokee Chief'*: light to dark pink bracts. *C.f. r. 'Sweetwater Red'*: light to dark pink bracts.

Cockspur hawthorn (*Crataegus crus-galli*). Small white clustered flowers during late spring. It has a rounded habit of growth while reaching

30-35'. Excellent for naturalized landscapes.

Lavalle hawthorn (*Crataegus x lavallei*). Medium-sized rose-white flowers in late spring. Its habit is an upright-oval, reaching 20'. Good as a specimen tree or in mass plantings.

Washington hawthorn (*Crataegus phaeopyrum*). Small white clustered flowers late spring. Mature habit is a 25-30' rounded tree. Use as a specimen tree or in mass plantings.

Green hawthorn (*Crataegus viridis* 'Winter King'). White flowers in clusters, late spring. Mature habit is a rounded 30-35' tree.

Carolina silverbell (*Halesia carolina*). Large white bell-like flowers during late spring. Rounded habit reaching 30-35'. Use in park or home landscapes.

Tulip-tree (*Liriodendron tulipifera*). Pale yellow with orange-marked large tulip-shaped flowers in late spring. Mature habit is an upright-oval, reaching 120' or more. Use as a specimen for large areas.

Cucumber tree (*Magnolia acuminata*). Large, yellowish-green flowers in late spring. Mature habit is a pyramidal 80-90' tree. It is effective as a specimen for large-area home landscapes.

Merrill magnolia (*M. x loebneri* 'Merrill'). Magenta flowers, during mid-May. A 40-50' oval tree at maturity. Good for home and large-area landscapes.

Lily magnolia (*M. quinquepetala*). Flowers purple outside, white inside, late spring. A small, rounded tree, reaching 15-20' in height. Most effective for home or naturalized landscapes.

Saucer magnolia (*M. x soulangeana*). Magenta and white flowers in late spring. Habit of growth—upright-oval, 20-30' in height. Use as specimen or in mass plantings. *M. x s. 'Alba Superba'*: white flowers. *M. x s. 'Alexandrina'*: flowers are white inside, magenta or dark purple outside.

Star magnolia (*M. stellata*). White, multi-petaled flowers, early in spring. Mature habit is an upright-oval, 15-20' in height. Effective as a specimen in large area of home landscapes.

Sweet-bay magnolia (*M. virginiana*). Creamy yellow flowers midsummer. A rounded tree 40-50' in height. Use as a specimen or in mass plantings in large areas.

Sourwood (*Oxydendrum arboreum*). Small white, bell-shaped flowers, resembling *Enkianthus*, midsummer. Vivid autumn color. A pyramidal tree that can, but seldom reaches, 60' in height; particularly effective as a specimen plant for the home or large-area landscapes.



R. H. Ne

The Carolina silverbell (*Halesia carolina*) is a small (30') tree. Its larger (90') larger-flowered cousin, Mountain silverbell (*Halesia monticola*) is even prettier but suitable only for larger sites.

Black cherry (*Prunus serotina*). White, drooping, clustered flowers during mid-May. This 70-80' tree is an upright-oval shape, particularly good in natural settings in large areas.

Black locust. (*Robinia pseudoacacia*). Small white flowers during early summer—70-80' with upright-oval, somewhat irregular habit of growth. Use in a large area or park landscapes.

Basswood (*Tilia americana*). Pale yellow, very fragrant flowers during late June into July.

An upright-oval tree, reaching 60-80'. Very effective as a specimen in a large area.

Europe

Western Europe has not contributed a significant number of flowering trees; however, the best would include:

Norway maple (*Acer platanoides*). Yellow-green flowers, mid-spring. Upright-oval habit of growth, reaching 80-90'. *A.p. 'Drummondii'*: variegated. *A.p. 'Columnare'*: narrow columnar

habit. *A.p. 'Crimson King'*: dark red foliage throughout the entire growing season. *A.p. 'Globosum'*: round ball, rarely exceeding 16' in height. *A.p. 'Schwedleri'*: dark red spring foliage turns green early summer; rounded habit.

Ruby horse-chestnut (*Aesculus x carnea 'Briotii'*). Red flowers, pyramidal clusters, mid-spring. 60-75'—outstanding specimen for all situations.

Common horse-chestnut (*A. hippocastanum*). White flowers with accents of red. Round specimen, 50-75'. For home or park.

European alder (*Alnus glutinosa*). Red and green catkins in March. Upright oval, almost columnar, 60-75'.

Little-leaf linden (*Tilia cordata*). Yellow flowers, mid-July. Pyramidal to upright-oval habit to 80-90'; specimen plant.

Silver linden (*T. tomentosa*). Yellow flowers, mid-July, (silver-green lower leaf surface). Pyramidal to upright-oval habit—70-90'.

Asia

Parts of Asia are prime sources of plants for the Northern United States because the climatic conditions are almost identical. Some of the notable introductions include:

Amur maple (*Acer ginnala*). Pale yellow flowers during June. Delicate branch structure and leaves with a 15-20' rounded habit. Very good specimen for home landscapes.



If you have poor, dry soil and much room, the black locust (*Robinia pseudoacacia*), with its fragrant June flowers, may be your answer.



Prunus persica 'Double White', a pure white flowering peach, is a stunningly floriferous spring-blooming small tree.

Mimosa tree (*Albizia julibrissin*). Light to rosy-pink flowers, late summer. 25–35' in height, somewhat rounded in habit. Use as a specimen tree.

Chinese fringe-tree (*Chionanthus retusus*). White, lacelike flowers, early summer. Habit is an upright-vase, 15–20'. Use as a specimen plant.

Kousa dogwood (*Cornus kousa*). Creamy white flowers, late May. Attractive fruit in autumn. Upright-oval habit. 20–25' in height. More blight-resistant than *C. florida*. *C. k. chinensis* 'Milky Way', creamy white flowers, pointed bracts. Use either for specimen in the home landscape.

Smoke tree (*Cotinus coggygria*). Flowers, fluffy yellow-white to red, giving the appearance of smoke. *C. c.* 'Royal Purple' has purplish leaves and fruit. 15–20' in height.

Golden-rain tree (*Koelreuteria paniculata*). Yellow upright, spiked flowers spilling down during late July followed by greenish fruit pods. A 25–35' rounded tree. Use as a specimen.

Crab-apple (*Malus* spp.). Very widely planted; attractive and popular. Select one hardy and disease resistant for your area. (See p. 10.)

Peach (*Prunus persica*). Pink or white flowers during May. Mature habit is a 25' upright-oval

tree. Use as a specimen for large areas in home landscapes.

Sargent cherry (*Prunus sargentii*). Single rose pink to white flowers during mid-spring; 40–50' large oval tree.

Oriental cherry (*Prunus serrulata*). White to pink single or double flowers (with certain cultivars extremely showy) during mid-spring. To 60', but most are 20–25', upright oval. Kwanzan cherry (*P.s.* 'Kwanzan'): double pink flowers mid-spring. 20' upright-vase shaped tree. As a specimen tree.

Higan cherry (*Prunus subhirtella*). Light to deep pink flowers, somewhat open. 20–25' rounded tree. Use as specimen. *P.s.* 'Pendula': pale pink to magenta flowers, mid-spring. 15–20' in height. Pendulous or weeping habit.

Callery pear (*Pyrus calleryana*). Small white flowers abundant, mid-spring. Upright-oval habit, reaching 25–30', somewhat open. Use for home landscapes and as a street tree. *P.c.* 'Chanticleer': more uniform, dense, upright-oval. *P.c.* 'Bradford': considered by many one of the best of all flowering trees for home or street tree use. Good autumn color. The form can be variable.

Korean callery pear (*P.c. fauriei*). 25–30' upright-oval tree. It has a tendency to become more open at maturity.

Japanese pagoda tree. (*Sophora japonica*). Creamy white clusters of flowers, mid-summer. 60–75' rounded tree. Use as a specimen plant for street plantings or home landscapes.

Korean mountain-ash (*Sorbus alnifolia*). Small white flowers, late spring followed by orange-scarlet fruit in autumn. 60–70', upright-oval.

Korean stewartia (*Stewartia koreana*). Large white flowers over a long period of time during the summer. Pyramidal habit of growth, reaching 35–45'. Multicolored, platey bark. Good specimen.

Japanese tree lilac (*Syringa reticulata*). Creamy white flowers during midsummer. 25–30' upright-oval tree. Very effective in the home landscape or as a street tree.

Doublefile viburnum (*Viburnum plicatum tomentosum*). Large, sterile white flowers in late spring, upright-oval habit, 10–15' in height. Use as an effective plant for mass planting in a large area or fewer for the smaller home landscapes.

Siebold viburnum (*Viburnum sieboldii*). Green to creamy white flowers, late spring. Oval to rounded plant, 10–15'. Extremely effective as a border plant or specimen. *



Silk-tree (*Albizia julibrissin*)

SUMMER-FLOWERING TREES FOR CENTRAL AND NORTHERN CLIMATES

Ruth Kvaalen

In the temperate zones, springtime is the period for greatest flowering, but with judicious selection the flowering season can be extended well into summer. The choices of trees for floral display become fewer as summer progresses for a simple reason: plants need a period after flowering to complete seed development. Most of the plants discussed here produce mature seeds before the start of winter so their flowering period is appropriately early.

Just When Does Summer Begin?

Listed in the table are a few trees that flower in the transitional period between spring and summer. The date of summer's onset depends

less on the calendar than on subjective notions of what summer is. Some people define summer-flowering trees as those that produce their blossoms after their leaves have fully expanded—a definition that would have summer begin toward the end of May. Other people relate summer to hot weather. Certainly, variations in geographic area (latitude, longitude, altitude, proximity to urban areas or to bodies of water) make it impossible to fix a date for summer's beginning.

Giving a schedule of bloom is also difficult. A rough sequence is possible, but two plants which bloom together one year may not do so the next year. Trees whose bloom times usually

coincide in one geographic area may not overlap in another area.

The primary reason we landscape with flowering trees is the ornamental aspect of the flowers, but several other reasons also might dictate their selection. Among these reasons are fragrance, fruit production, and attracting bees for honey production. Some trees, including black locust and certain lindens, are noted as "bee trees" and are equally valued for their nectar and for the fragrance of their flowers. Other summer-blooming trees may have inconspicuous flowers, but the seeds or fruits that follow are desirable for their ornamental qualities. One example is the winterberry euonymus, *Euonymus bungeana*, a small tree whose flowering passes unnoticed, but not the pink and scarlet fruits that dangle from long stems until well after the leaves have fallen.

Unlike annual or perennial flowers, the choice of colors among summer-flowering trees is limited. With a few notable exceptions, most summer-blooming trees bear white flowers. The combination of green foliage and white blossoms is serene and well suited to summer's relaxed mood.

Summer color can be achieved from other parts of trees besides the flowers. The Drummond Norway maple, *Acer platanoides* 'Drummondii', has green and white patterned foliage, as striking in the landscape as any flowering tree. The variegated alternate-leaved dogwood, *Cornus controversa* 'Variegata', is another handsome example of the decorative effect that tree foliage can offer. The silver lindens, *Tilia tomentosa* and its relative, *T. petiolaris*, have leaves with silvery undersides which are revealed on breezy days, creating a two-toned effect. Even seed pods may be attractive; wafer-ash, also called hop-tree (*Ptelea trifoliata*), has flat, waferlike seed pods of pale yellow-green shading to light tan that are subtly ornamental during the summer months. The landscaper who is alert to foliage and fruit colors can employ many trees for summer interest.

Most of the trees in the list that follow are hardy in southern New England, the Great Lakes states, and warmer areas; some of them can be grown in the northern tier of states. Where availability may be a problem, this fact is mentioned in the comments. The stated heights are defined loosely as: small, up to 25 feet; medium small, 25 to 40 feet; medium, 40 to 60 feet; tall, over 60 feet. Readers should check with their local nurserymen or County Extension agent for in-

formation on adaptability of these trees to local soil conditions or insect and disease problems.

Silk-tree or Mimosa (*Albizia julibrissin*). Not winter-hardy enough to achieve tree status in most areas, it may prove root-hardy to winter temperatures of -10 or -15°F if a hardy variety is used, such as 'Ernest Wilson'. Despite winter top-kill, it recovers to bloom with a profusion of pink balls of stamens in July through August. Known for exotic lacy foliage, wide-spreading growth habit (usually multiple-stemmed), but subject to disease and insect problems in some areas.

Chinese chestnut (*Castanea mollissima*). Medium spreading tree with crisp, clean foliage and unusual flowers—cream-colored, rather stiff, five-inch-long catkins in early summer. Hardy to -15 or -20°F . When cross-pollinated, edible nuts will be produced covered with bristly husks.

The taller American chestnut, *C. dentata*, is hardy to at least -25°F . Despite having been eliminated from its native range by disease, it may still be grown in refuges north and west of that area.

Northern catalpa or Western catalpa (*Catalpa speciosa*). Medium tall, erect tree with open branching habit and large leaves, it bears panicles of white flowers with yellow and purple markings in early summer. Cigar-shaped pods ("Indian beans") follow. Hardy to -30°F . Splendid in flower, but best in parklike settings for proper scale.

Southern catalpa (*Catalpa bignonioides*) is smaller and broader, flowering about ten days later than its northern counterpart, and with narrower pods. Hardy to -20°F .

Chinese or Japanese flowering dogwood, Kousa dogwood (*Cornus kousa*). A shrub or small tree that flowers in early summer, several weeks later than our native flowering dogwood. As in the native species, the inconspicuous true flowers are surrounded by white bracts, but in Kousa dogwood the bracts are pointed, giving a starry effect. The bracts may turn pinkish as they age. In mid-to-late summer, edible fruits resembling one-inch raspberries hang from the horizontal branches. The glossy foliage turns a handsome red in autumn. A number of selections have been named. Hardy to -15 or -20°F .

Bigleaf dogwood (*Cornus macrophylla*) and *C. x horseyi* are related to shrub dogwoods, but they achieve tree size and flower during mid-summer. They lack the bracts of the Kousa dogwood; instead, they have broad clusters of



Grosche-Schlesner

A spectacularly blossom-laden Japanese dogwood (*Cornus kousa*) in bloom in June. Its buds are still tightly closed during late frosts when its American cousin can be nipped.

creamy white flowers. At the present time these species are seldom available commercially. Hardy at least to -15°F .

Hupeh evodia (*Evodia hupehensis*). Medium-sized tree with smooth gray bark, compound leaves, and broad clusters of small white flowers in mid-to-late summer (July-August), followed by purplish fruits which open to expose glossy black seeds. Rarely available, although it and the related smaller species, Korean evodia (*E. danielii*), are valued for their abundant flowers at this season. Both are reputed to be somewhat weak-wooded. Hardy to -10 or -15°F .

Franklin tree (*Franklinia alatamaha*). Small multiple-trunked tree, shrubby in northern parts of its adapted range, hardy to -5 or -10°F , flowering in late summer (August and September). White flowers with a mass of yellow stamens are up to three inches across, superficially resembling camellia and stewartia flowers to which they are related. Fall foliage

color is brilliant red and orange. Franklin tree requires acid soil; it flowers best in full sun but will tolerate shade. This tree has an interesting history—it has not been found wild in its native Georgia habitat since 1790, so it may have been saved from extinction only by being grown as a cultivated plant. It is named for Benjamin Franklin.

Castor aralia (*Kalopanax pictus*). Large tree with stout prickles, even on the trunk, broad leaves lobed like a maple or sweet gum, and large inflorescences composed of umbels of small white flowers in midsummer. Coarse appearance makes it best suited to spacious areas. Hardy to -20°F . Scarce commercially.

Related to castor aralia are two other aralias which may be more readily available. They, too, have prickles on their stiffly upright trunks, and they bear large inflorescences of small white flowers in mid-to-late summer. Their doubly compound foliage creates a striking textural ef-

fect. They are Japanese angelica-tree (*A. elata*), growing to 30 feet or more, hardy to -25°F , and Devil's walkingstick or Hercules' club (*A. spinosa*), often shrubby or a small tree, hardy to -20°F .

Golden-rain tree (*Koelreuteria paniculata*). This small- to medium-sized tree is outstanding for summer color. It has showy panicles of bright yellow flowers in midsummer, followed by bladderlike seed pods that continue the ornamental effect as they gradually change from pale green through yellow to brown. Individual trees vary widely in date of flowering but most start flowering in midsummer. The cultivar 'September' was selected for late summer bloom. Hardy to -15°F , this species grows well under urban conditions and in dry and/or windy sites.

Amur maackia (*Maackia amurensis*). Medium-small tree bears white flowers, closely packed on upward tilted clusters in midsummer. The smooth bark is interesting—ranging from khaki-colored with orange overtones to cinnamon-colored, and it peels and curls slightly. A very hardy tree, it withstands winter temperatures to -30°F , possibly colder. Seldom commercially available at this time.

Sweet-bay (*Magnolia virginiana*, formerly *M. glauca*). A medium-sized tree in the South, this plant is often an open shrub or small tree in northern areas. The hardier selections will take winters to -15°F . Flowers are white, fragrant, about three inches across, and are borne intermittently from early summer on, followed by

curious red fruits. Foliage is evergreen or semi-evergreen, depending on plant and climate (the cultivar 'Henry Hicks' holds its foliage all year, even in the north). The leaves have glossy green upper surfaces and silvery white undersides. Grows well in moist, acid soil; tolerates shade.

The Oyama magnolia, *M. sieboldii*, is a small tree hardy to -10°F . It has large, fragrant, white flowers with ruby-red stamens, opening from early-to-midsummer. Limited availability.

In areas with mild winters, to about 0°F , the Southern magnolia or bull-bay (*Magnolia grandiflora*) can be grown for its magnificent evergreen foliage and large, fragrant flowers that appear sporadically throughout the summer after initial heavier bloom in late spring.

Sorrel-tree or Sourwood (*Oxydendrum arboreum*). Slow growing, small to medium-sized tree that is grown as much for its vivid scarlet autumn-leaf color as for its flowers. Handsome specimen throughout the seasons. It blooms in midsummer with abundant small white flowers borne at the ends of the branches in narrow, gracefully arching clusters. The ornamental effect continues as flowers are replaced by dry fruits. Grows best in acid soils; tolerates part shade. Hardy to -10 to -15°F .

Japanese pagoda tree, Chinese scholar tree (*Sophora japonica*). A medium-sized round-headed tree (the weeping form is smaller) that flowers in late summer (earlier in the south) with loose clusters of yellowish-white flowers which are followed by curious fruits resembling a string of beads, first bright green, ripening to yellow-



The white catalpa (*C. speciosa*) flowers are shot with purple, contrasting well with the large, heart-shaped leaves.



White, yellow centered 3" flowers against dark green leaves make *Franklinia alatamaha* a standout in late summer. In autumn the foliage is bright orange-red.

brown. Attractive dark-green foliage holds its color late. Tolerant of urban conditions, and hardy to -10 to -15°F . 'Regent' and 'Pendula' are cultivars, the former selected for ornamental qualities, the latter for pendulous growth habit, but 'Pendula' seldom flowers well.

Japanese stewartia (*Stewartia pseudocamellia*). Small to medium-sized tree, symmetrically oval. Noted for flower production during early and midsummer (over an especially prolonged period in cultivar 'Korean Splendor', formerly known as *S. koreana*). Flowers are two to three-and-a-half inches across, white with a center of orange stamens. This tree is also noted for autumn foliage color—burgundy red, yellow, or orange—and striking multicolored bark patterns in brown, orange, and gray. Truly a fine specimen in all seasons. Grows best in moist, acid soils with shade from midday heat. Hardy to -10°F , perhaps colder.

Mountain stewartia (*S. ovata*) is a smaller species useful for summer bloom, with purple stamens in the center of the white flowers, but lacking the multitonned bark color of the Japanese and Korean species.

Japanese tree lilac (*Syringa reticulata*, formerly known as *S. amurensis* var. *japonica*). Small tree, single or multistemmed. In early summer white flowers bloom in large pyramidal

clusters, with an odor like privet flowers (which some people find disagreeable). Foliage is similar to common lilac, and plants are susceptible to the same problems as other lilacs. Very cold hardy, to -35°F or more. 'Ivory Silk' is a cultivar introduced from Canada.

The Peking lilac (*Syringa pekinensis*) is similar in flowering but is more shrubby, less hardy, and less readily available. Like the Japanese tree lilac, some Peking lilacs have handsome reddish bark, similar to that of ornamental cherry trees.

Linden or Basswood (*Tilia* spp.). Lindens are planted as shade or street trees, but they also are noted for very fragrant, abundant flowers in early to midsummer. The flowers are small and hang just beneath narrowly oblong, pale green or tan bracts, which give an ornamental effect when the tree is covered with them. Several species are available, among them the littleleaf linden (*T. cordata*, hardy to -35°F , many cultivars available), bigleaf linden (*T. platyphyllos*, hardy to -35°F), and basswood or American linden (*T. americana*, hardy to -40°F or colder).

Among other trees that might be included is the autumn-flowering form of Higan cherry, *Prunus subhirtella* 'Autumnalis', which reblooms sporadically with semi-double pink flowers

Trees for Late Spring and Early Summer Flowers

Botanic Name	Common Name	Hardiness (°F)	Comments
<i>Aesculus x carnea</i>	Red horse-chestnut	-20 to -25	Small to medium-sized tree that will flower young; red or rosy pink flowers borne in upright clusters.
<i>Chionanthus virginicus</i>	Fringe-tree	-20 to -25	Large shrub or small tree with pendant clusters of white flowers, followed by blue-black fruits on pistillate plants if staminate plants are nearby.
<i>Cladrastis lutea</i>	Yellowwood	-25	Small tree with loose, pendulous clusters of fragrant white flowers; may tend to alternate year blooming.
<i>Crataegus phaenopyrum</i>	Washington hawthorn	-25 to -30	Small tree with long thorns, white flowers, glossy foliage, showy red fruits that persist into winter.
<i>Elaeagnus angustifolia</i>	Russian olive	-40	Small tree grown for gray foliage; yellow flowers are inconspicuous but very fragrant.
<i>Laburnum x watereri</i>	Golden-chain tree	-10	Small tree with showy yellow flowers in long, pendulous clusters.
<i>Liriodendron tulipifera</i>	Tulip-tree, yellow poplar	-20 to -25	Large shade tree related to magnolias; green and orange flowers are large but not highly visible against foliage.
<i>Robinia pseudoacacia</i>	Black locust	-25	Medium to large tree often covered with pendulous racemes of white, fragrant flowers in late spring or early summer.
<i>Sorbus spp.</i>	Mountain-ashes	-25 to -40, depending on species	Small trees with flat clusters of white flowers followed by colorful orange or red fruits.
<i>Styrax japonicus</i>	Japanese snowbell	-10	Small tree with dainty white flowers pendent beneath the horizontal branches.

in autumn, with fullest flowering in spring.

Several summer-flowering trees which are rarely available should be mentioned here; they are dealt with in more detail elsewhere in this handbook: Chinese toon tree, *Cedrela sinensis*; Chinese parasol tree, *Firmiana simplex*; Japanese raisin tree, *Hovenia dulcis*; and epaulette tree, *Pterostyrax hispidus*.

Tree-Trained Shrubs

Certain summer-flowering shrubs grow tall enough to be trained into small trees, or even as shrubs merit inclusion in a planting for their off-season color. Among them are paniced hydrangea (*Hydrangea paniculata*), white flowers in mid-to-late summer; tamarisk (*Tamarix* spp.)

with rosy-lavender flowers and bluish-green foliage in very fine-textured sprays, midsummer; sumac (*Rhus typhina*, *R. copallina*, and other species), greenish flower clusters followed by crimson fruits on pistillate plants, vivid, early autumn foliage color. The shrub althea or rose-of-Sharon (*Hibiscus syriacus*) is noteworthy for its large single or double flowers in late summer in a range of colors—white, pink, rose, violet and bluish tones in solid or bicolored combinations. A autumn-flowering witch hazel, *Hamamelis virginiana*, finishes the flowering season in the north by blooming in mid-to-late autumn, bearing small yellow flowers that are not conspicuous except at close range, but notable for their fragrance. ☺

FLOWERING TREES – ONE PERFECT FOR EVERY GARDEN

Gräfe + Schäffer



The carmine crab-apple (*Malus x atrosanguinea*) has dense dark green shiny leaves to dramatically complement the crimson buds opening to deep rose pink.



Campbell magnolia (*M. campbellii*), for zones 8 and 9, is an exquisite shell pink with good fragrance. Because it grows quite tall, it needs plenty of room.



Blooming when the shad run in spring, shadblow or service-berry (*Amelanchier canadensis*) is a hardy, long-lived tree eventually reaching 60 feet.



A touch of the tropics hardy to Boston, silk-tree (*Albizia julibrissin rosea*) has a wide, flat-topped habit and can be grown multistemmed.



When flowering dogwood (*Crataegus*) is in bloom, it is memorable—the numerous drooping clusters of flowers which it bears.



Saucer magnolia (*M. x soulangeana*) is hardy to Boston, with flowers ranging from white to rosy purple, all with a fragrance.



florida) puts on a display, its
festivals attest to the esteem in
which it is held.



has many color varieties from
characteristic silky-petaled goblet

George Tidmarsh



Courtesy of J. A. Witt
With bracts up to 5 inches across, the lesser-known
native Pacific dogwood (*Cornus nuttallii*) is a
splendid sight in April. It grows nearly twice as
tall as its eastern relative.



A bright woodland surprise, blooming at the same
time as flowering dogwood, eastern redbud (*Cercis
canadensis*) is an open small tree with heart-
shaped foliage.

Pamela Harper



The low, wide habit and pure white flowers of
Sargent crab-apple (*Malus sargentii*) have assured
its popularity for nearly one hundred years.

Flowering Trees with Unusual Blooms



Photos from color slides by Pamela Harper

With heavily spined trunk and branches the well-named Devil's walking stick (*Aralia spinosa*) (left) has large foamy panicles of creamy white flowers. Right, cascades of deep yellow blossoms on a small tree (to 30 feet) in late May have made the Waterer laburnum (*L. watereri*, *L. vossii* of the trade) popular among homeowners both here and in Europe.



A native of eastern and central North America, the pagoda dogwood (*Cornus alternifolia*) can have cymes that vary from deep blue to creamy white, any of which contrast well with the familiar dogwood leaves.



Sourwood (*Oxydendrum arboreum*)

FLOWERING TREES FOR THE SOUTH

Fred Galle

Crape-myrtle, one of the showiest summer-flowering trees in cultivation, is very popular in the south. A native of China, it was introduced in America in the late 1700s. While often treated as a large shrub, the best use is as a multiple stem, small tree, 20-30 feet tall. The frilled flowers, while generally pink, range from white to red to light purple, and are borne in large terminal clusters four to ten inches long. The flowers appear from late June to September, and by cutting off the old flowers, rather than letting them go to seed, another crop of flowers will be produced. The autumn color of the leaves ranges from orange-yellow to red, and the smooth mottled bark is attractive through the winter months.

There are many named cultivars from which to select and the new introductions from the National Arboretum offer the bonus of mildew resistance. One bigeneric hybrid, 'Natchez', will soon be in popular demand. This plant is more vigorous than others and its smooth shiny mottled trunk is very attractive; flowers are white. Crape-myrtles are best used in zones 7b to 9b; in colder regions it is a cut-back shrub.

Camellia sasanqua, while often treated as a large shrub, makes an excellent small tree 20-25 feet high. It performs best in zones 7a to 10. The flowers are single to double and range from white to pink. A multiple-trunked specimen of *C. sasanqua* with its light tan bark and evergreen foliage offers year-round pleasure with

the extra bonus of attractive autumn flowers.

Several native trees of the south deserve more attention. **Sourwood** (*Oxydendrum arboreum*), provides many periods of seasonal interest. It is one of the first to change color in the late summer and early autumn, and the colorful orange-to-red leaves persist until late. The terminal white-clustered (panicked) flowers are borne in late spring and contrast with the dark glistening foliage. It is shallow rooted and often difficult to move from the wild, but fortunately is available in many areas as a container-grown plant.

Loblolly-bay (*Gordonia lasianthus*), is a beautiful evergreen tree with attractive single, white camellialike flowers in mid-to-late summer. It is not as hardy as the deciduous *Franklinia alatamaha* and grows best in zones 8b to 10. Franklinia, while hardy in zone 5, is very susceptible to root rot and should be planted in well-drained sites.

Silky camellia (*Stewartia malacodendron*), has finally found its way into several southern nurseries. It is a small deciduous tree with attractive three-inch single white flowers and contrasting purple stamens. The attractive mottled bark and orange-red autumn foliage are added features. Stewartias are still rare plants in the general landscape, but the two native and the five introduced species are all excellent early-summer-flowering small trees.

Chaste-tree (*Vitex agnus-castus*), is often found in old southern gardens. Multiple-trunk specimens with showy light purple clustered or spiked flowers in the summer are excellent in combination with crape-myrtles. The palmately compound bluish-green leaves and stems are aromatic. While common as a cut-back shrub in the midwest and parts of the northeast, it is a hardy small tree in the south. An off-white flowered form is available, but is not as attractive as the common light purple.

Oleander (*Nerium oleander*), is a large, attractive flowering shrub, a small tree for the deep south, zones 8b to 10. They are very drought tolerant and the showy white to deep pink-purple flowers are borne throughout the summer. While it is an attractive plant, it has one drawback—all parts of the plant, including the flowers, are poisonous if eaten.

Many common flowering trees of colder areas become alternate-year or sporadic bearers. These include most flowering cherries and crab-apples, which only produce occasional flowers. Check reliable local sources for information on the best selections. We have found the following three crab-apples reliable—*Malus floribunda*, 'Callaway' and 'Dorothea'.

The common pink dogwood, cultivars of *Cornus florida*, are difficult to grow in zones 8b and 9. The cultivar 'Junior Miss', while having smaller pink bracts, is heat tolerant. ☘



Photo from a color slide by Pamela Harper

Loblolly-bay (*Gordonia lasianthus*) blooms for two months in summer producing Franklinia-like but fragrant 2½" white flowers.



Fragrant frangipani (*Plumeria rubra*)

FLOWERING TREES FOR THE VERY DEEP SOUTH

Tom Sheehan

It has often been stated that as you travel toward the equator you will find more flowering plants with larger flowers. Although this might not be a completely accurate statement, it is true that many warmer climates are blessed with a rich variety of flowering trees—an array of trees that often provide flowers throughout most of the year. Many of these tropical and subtropical flowering trees can be found growing in the very Deep South and a number in this group are the right size for the average home property.

Because no list of plants is ever complete nor will any two people agree completely on which plants make up the top ten flowering trees for any given area, here is a representative selection of twenty-five trees that will enhance many Deep South landscapes.

Orchid tree (*Bauhinia* spp., Zone 9b-10). A wide variety of orchid trees is available and, with careful selection, continuous flowering is possible in a choice of colors from early autumn through late spring. These small, Southeast Asian and tropical American trees are easily recognized by their leaves, which resemble cloven hooves. The lavender-flowered species resemble orchids to the untrained eye.

Weeping bottlebrush (*Callistemon viminalis*, Zone 10). Weeping bottlebrush resembles weeping willow except it is smaller, gray-leaved and very colorful when in bloom. This small tree is covered with large, deep red brushlike inflorescences every spring. The hard seed capsules persist for years and are useful in dried arrangements.

Golden-shower (*Cassia fistula*, Zone 10). In late spring when the tree is almost bare of leaves, hundreds of pendent chains of golden-yellow flowers suddenly appear on this Indian native, and soon the ground beneath the tree is carpeted with gold. Large compound leaves appear after flowering, giving the plant a light, airy appearance. Long brown seed pods intermingle with the foliage.

Silk-floss trees (*Chorisia speciosa*, Zone 9b-10). Although the trunk is heavily armed, the South American silk-floss tree is an ideal landscape subject. The three-to-five-inch flowers often appear when the tree is leafless and trees are available in a variety of flower colors. They bloom in autumn in Florida. Soon thereafter large capsules develop which pop open to release the silky floss.

Scotch-attorney tree, Signature tree (*Clusia rosea*, Zone 10). Dark green, thick leathery leaves along with showy thick-petaled white or pinkish flowers combine to make this another landscape favorite. Grown as a tree, or even trained as a shrub, this tropical American plant is very attractive. Sign your name on a new leaf and your signature will persist for three or four years, and will remain even on the fallen leaf. Although the fruits are very attractive and may appear to be good subjects for dried arrangements, they soon shrivel up.

Buttercup tree (*Cochlospermum vitifolium*, Zone 10b). The four-inch, golden-yellow flowers, single or double, are borne at the apex of leafless branches and stand out strikingly against the blue tropical sky. The giant buttercuplike flowers make this tropical American tree a most desirable landscape subject. The large leaves of this deciduous tree appear after flowering and resemble grape leaves.

Colvillea (*Colvillea racemosa*, Zone 10b). The gracefully curving racemes of bright orange-red velvety flowers appear to be gushing forth like small fountains from the crown of the tree, making this Madagascan native a choice landscape feature. Even when not in flower, the long (3 feet) finely divided leaves enhance this tree's attractiveness.

Geiger tree (*Cordia sebestena*, Zone 10b). This delightful tree, native to the Florida Keys, provides color most of the year. Each branch of dark green, hairy leaves is topped by a small cluster of orange-red showy flowers followed by small oval white fruits. A well-grown tree will be constantly decorated with both the orange-red flowers and the white fruits.

Royal poinciana (*Delonix regia*, Zone 10b). Bright scarlet flowers completely hide the crown of this widespread umbrella-like tree in late spring and early summer. So intense is the color of the flowers that seen from a distance, they appear to be engulfed in flames. This African native bears seed capsules that resemble giant dark brown lima-bean pods. When it is not in bloom, lacy foliage covers the tree. This tree tends to be messy when the pods fall.

Coral tree (*Erythrina* spp.). There are around 100 species of this desirable group of tropical plants and although mostly armed, their attractive, showy reddish flowers overshadow their possible faults. *E. crista-galli*, Zone 9, and *E. variegata*, Zone 10, are two popular members with excellent blooming characteristics. *E. crista-galli* often flowers within the crown of the plant, while *E. variegata* flowers at the branch tips before or just as the leaves are unfolding. In tropical areas large branches up to six inches in diameter can be planted and will root. They are called instant trees in Southeast Asia.

Silk-oak (*Grevillea robusta*, Zone 10). These stately Australian trees may reach 150 feet in their native habitat, but are usually less than half of that in Florida. In spring the new growth is covered with light gray silken hairs and the evergreen, dissected leaves are gray-green. In late spring masses of short orange brushlike inflorescences develop on the older wood, giving the tree canopy a very attractive mottled green and orange appearance.

Mahoe (*Hibiscus tiliaceus*, Zone 10b). Although a small tree (20 feet high) it may have a spread of twice its height so it is ideal for large open areas. The branches of aspenlike leaves are topped by hibiscus flowers that are yellow when they open in the morning, but turn coppery-red by nightfall.

Jacaranda (*Jacaranda mimosifolia*, Zone 10). This large South American tree bursts forth in early spring with a mantle of blue flowers followed by the dainty fernlike leaves. Occasionally it will produce a smaller flush of flowers in August. The delicate leaves and open framework of the tree produce ever-changing shadow patterns in the landscape. This is also an excellent street tree. Over 50,000 jacaranda trees line the streets of Pretoria, South Africa.

Sausage tree (*Kigelia pinnata*, Zone 10b). If there was ever a true conversation piece, the sausage tree from tropical Africa is it with its compound leaves, large flowers and unusual fruit. During the summer months large pendent



To describe the 4-inch tulip-shaped pendulous blossoms of African tulip-tree (*Spathodea campanulata*) as vermillion is almost to underrate the intensity of the red.

inflorescences bear numerous four-inch claret-colored flowers which open in the late afternoon and fall early the next morning. If the plant has been successfully pollinated by bats, large (one-

and-one-half-foot-long) gray, inedible, sausage-like fruits will develop, persisting for a very long time.

Queen's crape-myrtle, Pride-of-India

(*Lagerstroemia speciosa*, Zone 10). Where they are native Queen's crape-myrtles grow to 80 feet and are a spectacular sight when in bloom. Even as a small tree, every branch tip will bear a large cluster (panicle) of white or purple one-inch flowers with each flower containing around 200 stamens. Although widely grown in the tropics, it is often overlooked in the warmer subtropics where it is outstanding in any garden.

Punk tree, Paperbark (*Melaleuca quinquenervia*, Zone 10). The soft thick grayish-white bark peels in thin papery layers which makes this a most attractive specimen for the home landscape. The showy white brushlike inflorescences cover all branch tips in spring and are much sought after by bees. Copious amounts of seed are produced and this Australian tree, which is highly resistant to fire and naturalizes readily.

Montezuma (*Montezuma speciosissima*, Zone 10b). At first glance the shiny, dark-crimson flowers look artificial, as if they were made of patent leather and hung among the large dark green leathery leaves. Native to Puerto Rico, this hibiscus relative makes an ideal street tree, as well as an excellent flowering tree for medium-size properties. Unfortunately, the flowers hang down and one must lie under the tree and look up to enjoy their beauty.

Ochrosia (*Ochrosia elliptica*, Zone 10b). Flowering throughout the year, the creamy white flowers followed by bright red, often paired, violet-scented fruits, stand out against a background of dark shiny green leaves. This Australian native is a very fine small tree for the home grounds or as a street tree.

Yellow poinciana (*Peltorphorum pterocarpum*, Zone 10b). Yellow poinciana could easily be called the double-duty tree as it has two colorful blooming periods. In spring or early summer the crown of the tree is completely hidden by large (18-inch) panicles of one-and-a-half-inch bright yellow flowers. These are followed in several weeks by a covering of purplish-brown winged seed pods. The rest of the time a filigree of dark green compound leaves gives the trees an attractive appearance.

Frangipani, Temple tree (*Plumeria rubra*, Zone 10b). Undoubtedly best known as the Hawaiian lei flower, frangipani is also an ideal small tree for the home landscape. These small coarse-branched deciduous trees flower in spring before the leaves appear and each branch bears a large cluster of white, yellow or rose-colored fragrant flowers. The usually dull green

leaves are large, up to 20 inches long, and clustered near the branch tips. Flowering continues during the summer months.

Shaving-brush tree (*Pseudobombax ellipticum*, Zone 10b). Even when small, this Mexican native is a sight to behold when flowering. Flower buds resembling brown felt acorns appear in early spring. The acornlike bud grows until it looks like a four-to-six-inch cigar in a holder. Finally at maturity, each day at around four in the afternoon the petals peel back like a banana skin revealing literally hundreds of pink, red or white anthers arranged in shaving brush fashion, putting on a vivid show. Large leaves follow flowering.

African tulip-tree (*Spathodea campanulata*, Zone 10b). Exceedingly handsome and showy would be the easiest way to describe this colorful tropical African evergreen tree. The dark green, shiny, compound leaves form a perfect background for the numerous clusters of four-inch tulip-shaped vermillion flowers which appear all year. The flowers are followed by large brown seed pods, which split in half at maturity into two boatlike segments.

Trumpet trees (*Tabebuia* spp., Zone 10b). There are few trees that are as showy and as widely used as the trumpet trees. Throughout the tropics, streets are often lined with these colorful trees. Some flower profusely at one time while others flower over a long period of time. The yellow, pink or white trumpet-shaped flowers and delicate palmately compound leaves make these plants desirable landscape subjects.

Yellowbells, Yellow elder (*Tecoma (Stenolobium) stans*, Zone 10 to 10b). This tropical American native can be used effectively in the landscape, either as a small tree (20 feet) or as a shrub. Large showy clusters of yellow trumpet-shaped flowers are borne at the tips of all the branches. A background of medium green compound leaves completes the picture. Amerinds used the wood to make hunting bows.

Be-still tree, Lucky nut tree (*Thevetia peruviana*, Zone 10 to 10b). Resembling an overgrown oleander with large yellow flowers, lucky nut is a fine small tree for the home grounds. The seeds of these tropical American trees are black and shiny, and are often carried as talismans in their native areas. The funnel-shaped flowers are borne all year, and there is always a scattering of ripening black fruit making the tree attractive at all times. Use at the rear of your property to increase the illusion of depth. 



Golden-chain tree (*Laburnum x watereri*)

ROCKY MOUNTAIN REGION FLOWERING TREES

James R. Feucht

Climatic and soil extremes in the Rocky Mountain Region enable the gardener in this high country to grow a wide variety of flowering trees, yet caution is needed in the initial selection as well as close attention to subsequent exposure.

The Rocky Mountain area can be roughly divided into two parts, the High Plains, ranging in elevation from 3,500 to 6,000 feet and the Mountain region, 6,000 feet to over 14,000 feet.

The Plains areas generally have alkaline soils, often poorly drained, and low precipitation. Many mountain areas have well-drained, acid soils and greater amounts of precipitation.

If microclimatic influences are studied before selection of a tree, species often not considered "hardy" for the region can be grown successfully. An example is the golden-chain tree (*Laburnum x watereri*). By protecting against sunscald and cold and desiccating winter winds,



The frothy white flowers of European mountain-ash (*Sorbus aucuparia*) are followed by clusters of bright orange-red berries.

the Rocky Mountain gardener can grow this species at elevations up to 5,500 feet. The same can be said for saucer magnolia (*Magnolia x soulangiana*), Paul's scarlet hawthorn (*Crataegus laevigata 'Paulii'*) and golden-rain tree, (*Koelreuteria paniculata*). The last has been found to be very successful in saline soils.

Japanese pagoda tree (*Sophora japonica*), has shown a surprising ability to adapt to elevations below 6,000 feet. Like golden-rain tree, it tolerates soil of relatively high salinity. Its habit of producing a late flush of growth makes it vulnerable to frost, but it recovers.

Eastern redbud (*Cercis canadensis*), was once thought to be successful only in the acid soils of the eastern states. Tests have proven this false. Except for the very alkaline sites (over pH 8.0), redbud thrives as long as it is placed in an east or north exposure. Heat, not cold or soil pH, seems the biggest limitation in this area. Because it blooms later than cherry, peach, and most crab-apples, it often escapes damaging frosts.

Rose Family Members

The most common flowering trees in the Rocky Mountain region are crab-apples (*Malus spp.*). Were it not for the severe fire blight attacks on this genus, the crab-apples would be the perfect combination of hardiness, colorful flowers and soil adaptability.

Among the more blight-resistant crab-apple cultivars are 'Dolgo', 'Spring Snow', 'Snowdrift' and 'Radiant'. Unfortunately, popular red-flowered forms such as 'Hopa' and 'Strathmore' and doubles such as 'Bechtel's' are very susceptible to the disease in the Plains region. In mountain communities, even at elevations over 8,000 feet, the hardier crabs, especially 'Hopa' and 'Dolgo' do well and escape fire blight.

Several species and cultivars of hawthorn (*Crataegus*) perform well in the high elevations. Among the hardiest are cockspur (*C. crus-galli 'Downy'*), *C. mollis* 'Winter King', (*C. viridis 'Winter King'*) and Russian crab-apple (*C. ambigua*). The last has shown adaptability to extremes of both temperature and soil conditions. The small, shiny leaves and persistent scarlet fruit make this species very popular.

European mountain-ash (*Sorbus aucuparia*), while better known for its brilliant red fruit, is a popular flowering tree. In the Rocky Mountain region, its primary limitation is sunscald. Protection with tree wrap for at least two winter seasons is advised to ensure establishment.

Among the most reliable cherries are purple-leaved Shubert chokecherry (*Prunus virginiana* var. *melanocarpa* 'Shubert') and European bird-cherry (*P. padus*). Both species have been grown with success at elevations above 9,000 feet.

Climatic limitations rule out some of the more ornamental Oriental cherries common in mid-western and eastern states. Gardeners must be content with common sour cherry (*P. cerasus*), the main ingredient in cherry pie.

A relative newcomer to the Rocky Mountain area is Bradford pear (*Pyrus calleryana* 'Bradford'). Even though flowers are frequently frozen most springs, the stately upright habit, glossy foliage and burgundy autumn color make this tree worth growing. Its hardiness has not been fully tested, but there are many fine specimens that have survived -20°F.

Buckeye, Horse-chestnut, Russian-olive

Several species of buckeye and horse-chestnut should be mentioned. Ohio buckeye (*Aesculus glabra*) seems to be the most adaptable among

the species. It thrives in alkaline soils and withstands low winter temperatures. Perhaps more showy than the yellow flowers is the brilliant red-orange autumn color. Horse-chestnut (*A. hippocastanum*, including the double-flowered cultivar, 'Baumannii') while less hardy than Ohio buckeye, can be grown successfully at elevations of 6,000 feet or below. Because of the broad conical growth habit, however, these species are rarely grown as a backyard tree; they are more likely to be seen in city parks.

While not often thought of as flowering trees, Russian-olive (*Elaeagnus angustifolia*) is widely planted. The sweet fragrance of the tiny yellow flowers and the contrasting gray-green foliage make this tree popular.

Russian-olive was introduced to the High Plains and Rocky Mountain areas originally for shelter-belt plantings. The ability of the species to withstand saline soils and prolonged drought made it a natural for this purpose. Russian-olive is now naturalized throughout the Rocky Mountain region below 6,000 feet. Above this elevation, it may suffer die-back during extremely cold winters. Deer and elk also like to browse the tree which results in stunted shrubs.

The Rocky Mountains, because of their high elevation, short growing season, and often "difficult" soils, present many challenges for the gardener who wants colorful flowering trees. Soil and microclimatic factors *must* be evaluated before selecting candidates. ♦



The abundant lavender-tinged pink flowers of Eastern redbud (*Cercis canadensis*) appear to spring right out of the bark.

FLOWERING TREES FOR THE PACIFIC NORTHWEST

J.A. Witt

Tall timber country, the western edge of North America from southern Oregon northward into southern British Columbia west of the Cascade Mountains, has somewhat homogenous gardening conditions. It is marked by generally acid soils and a mild maritime climate, which might be termed "modified Mediterranean." Rainfall is normally heaviest in the winter, and summers are dry. Temperatures seldom are excessive, neither hot in summer nor cold in winter. In short, it is an easy climate in which to grow a broad spectrum of flowering trees. Naturally, within such a large region, there are many microclimates which, within a few miles, may change dramatically. Because of this, certain favored sites will be able to grow more tender plants than usually might be found within the region. Conversely, less favored gardens will not be able to grow even moderately tender trees.

The following, arranged by flowering season, includes flowering trees which are generally hardy throughout the entire area; those which are on the tender side will be noted.

Early Spring (February, March and Early April)

Members of the genus *Prunus* are the most reliable of early blooming trees and start the flowering parade with the first warm days after the first of the year. The autumn-flowering Japanese cherry (*P. subhirtella* 'Autumnalis') actually flowers sporadically throughout the winter months but reaches a climax in late February when the entire tree will be covered with the palest of pink semidouble flowers. Its relative, the Japanese spring, or Higan, cherry (*P. subhirtella*) comes in several forms which include weeping types, those with single to double flowers, and bright to soft pink flower colors. The Whitcomb cherry (*P. subhirtella* 'Rosea') is a popular choice, since it has an elegant low-spreading habit and large bright pink flowers.

Flowering plum (*Prunus x blireiana*) is equally popular. A small tree to 25 feet with soft pink double flowers and purple foliage, it is a bright harbinger of spring, often seen in parking strips along Pacific Northwestern streets.

The closely-related, purple-leaved cherry-leaved plum (*P. cerasifera* 'Atropurpurea', available in several forms) is commonly used as a street or specimen tree both for its early blooms and its coppery-red foliage.

Other cherry species and hybrids follow on the heels of the plums. Yoshino cherry (*P. yedoensis*) and its cultivar 'Akebono' are widely used. Both develop a spreading habit at maturity, growing to 50 feet tall. The former has pink, fading to nearly white, flowers, while 'Akebono' produces brilliant pink blooms. Another spring cherry from Japan, Sargent cherry (*P. sargentii*), is less commonly available but makes a superb specimen with a round head to 50 feet and blush pink flowers covering the tree. A hybrid of Sargent cherry, 'Accolade', has gained attention recently. It has a smaller habit and large semidouble pink flowers.

As the early cherries fade, another group of Japanese cherries takes over. These are the *Prunus serrulata* cultivars. The first to bloom is the single white wide-spreading 'Shirotae', often called 'Mt Fuji'. Then follows a host of other cultivars including the overly popular 'Kwanzan', double rosy pink; 'Amanogawa', narrowly upright with large soft pink double blooms; 'Ukon', yellow-green semi-double flowers on an open upright tree; and 'Shogetsu', low and spreading, with semidouble clear white flowers in late spring. There are many other fine cultivars, but they are often difficult to find in the nursery trade.

Magnolias, especially the deciduous early flowering species, bloom with the early cherries, often in March and early April. Not for every garden, since they are big trees often 50 feet or more tall and some may need protection in colder microclimates, they are truly magnificent where they can be grown well. Campbell's magnolia (*M. campbellii*) is the earliest. Its six-to-eight-inch chalice-like flowers are deep rose to white and may cover the open bare branches of the tree for two or more weeks. Its hybrid with *M. campbellii* subsp. *mollicomata* is equally good, but is slightly more bud tender. *M. sargentiana* and its variety *robusta* have huge



Pink flowers of the cherry-leaved or pissard plum (*Prunus cerasifera* 'Atropurpurea') contrast strikingly with the reddish-purple to coppery-red foliage.

mauve pink flowers, often contorted, that are spectacular if somewhat untidy. A week or so later, the pink erect bowls of *M. sprengeri* 'Diva' appear along with those of the paler *M. dawsoniana*. All of these *Magnolia* species can lose their buds in unusually cold winters, but the occasional loss of a year's flowers is soon forgotten when they flower in their full glory against the washed blue of a spring sky.

Much less apt to be damaged by winters are the northern Chinese and Japanese magnolias with white flowers: Yulan (*M. heptapheta*, *M. denudata*); *M. kobus*; and willow-leaf magnolia (*M. salicifolia*). The Yulan may well be the finest white-flowered tree for northern gardens. Its beauty is in the crisp erect cups of ivory-white flowers which cover the forty-foot trees in early April. Unfortunately, it is rare in nurseries. The latter two are rather similar when in flower and make brave shows seen against the dark green background of native conifers.

Mid-Spring (Mid-April and May)

The height of the flowering tree season occurs when the dogwoods come into bloom. The first is the "noblest of the cornels," *Cornus nuttallii*, the Pacific flowering dogwood. It is often 40 or more feet tall and spreads its petallike bracts in early April. These, unlike its eastern relatives, may be four, five or six in number and up to six inches across. Several cultivars are available including 'Colrigo', a form with very large bracts and 'Eddiei', sometimes called 'Goldspot', which has golden variegated foliage.

A hybrid between *C. nuttallii* and *C. florida*, 'Eddie's White Wonder' flowering shortly after the former and before the latter, is intermediate between the two parents both in bloom and habit. The eastern flowering dogwood usually reaches full bloom in early May and has many cultivars to choose from. Red cultivars are the most popular, unfortunately, since few small trees are as handsome as a well-grown white selection making a rounded white cloud against a dark backdrop.

April and May are the months of the crab-apples, *Malus* species and hybrids. These handsome trees are not as widely used in the Pacific Northwest as they are further east, yet most will grow well there. Apple scab and mildew are problems which are best avoided by selecting resistant forms. *M. 'Dolgo'* is a good single white, *M. floribunda* is probably the best of apple-blossom pink types, while 'Profusion' is a fine resistant form with purple-red flowers. Many others could be selected, especially if the gardener is interested in fruits as well as flowers.

The closely-related hawthorns (*Crataegus*) are represented mainly by *C. laevigata* (*oxyacantha*) 'Paul's Scarlet', much overused as a small street tree, and the similar *C. monogyna*, the British May tree.

Carolina silverbell (*Halesia carolina*) is a favorite for its wealth of white or soft pink bell-shaped flowers carried on the tree before its leaves, and nearly always in bloom by May Day.

Golden-chain tree is much used, and in fact, has become an advantageous addition to the

flora of the Pacific Northwest. The hybrid, *L. x watereri*, used by more discriminating gardeners because of its exceptionally long flower clusters, blooms about a week to ten days later.

Redbuds (*Cercis* spp.) are not as common as in eastern gardens. In fact, the American *C. canadensis* seems to require a warmer spring than is usual in much of the area. Its Chinese and European relatives, *C. chinensis* and *C. siliquastrum* or Judas Tree, seem better suited and often flower more freely.

Late Spring and Summer (Late May and June)

Magnolias make another appearance in late spring and early summer. Big-leaf magnolia (*M. macrophylla*) with gigantic white flowers and equally large leaves, is a tree for protected areas,

since it needs shielding from strong winds. The Japanese *M. hypoleuca* (*obovata*) will stand more exposure and makes a well-formed tree to sixty feet tall with intensely fragrant cup-shaped white flowers. Later yet, the evergreen magnolia (*M. grandiflora*) starts its extended flowering, which may last until late autumn. Several cultivars are available including 'Victoria', a local selection from the British Columbian city of that name, 'Goliath', with giant flowers, and 'St. Mary', which has proved to flower at a younger age than the usual forms. Needing protection in cooler microclimates, the evergreen magnolia is certainly one of the finest broad-leaved evergreens for the area.

The stewartias are magnificent flowering trees and will grow without special care nearly anywhere in the Pacific Northwest. The largest flowered, *S. pseudocamellia*, normally opens



Geischo-Schleiner

The early spring-blooming Yulan magnolia (*M. heptaphala*) is fragrant, white, and resistant to frost damage.



Rudie

The exquisite tiers of small white bells that characterize Japanese snowbell (*Styrax japonica*) are displayed to best effect if the tree is placed on a rise so one can look up into it.

its single white camellialike flowers in late June to early July, and is followed by the smaller flowered *S. monadelpha*. Both are worth growing for their beautiful multicolored flaking bark and autumn color. Blooming along with the stewartias are the styrax. The most commonly used is the Japanese snowbell (*S. japonicus*) a small, intricately branched tree which covers itself with pendent white bells. The fragrant styrax (*S. obassia*) is a bolder plant, larger of leaf and with drooping racemes of white flowers. Both are excellent used in a woodland setting. Japanese dogwood (*Cornus kousa*) is also used in the woodland, often with late-flowering rhododendrons. A "three season" tree, its starry flowers covering the upper surfaces of the branches are followed by bright red fruit and red-orange autumn color.

Less common than the above and distinctly more tender is the brilliant Chilean firebush (*Embothrium coccineum*). A small, erect tree, semi-evergreen, in late June its entire top may be a mass of flame red honeysucklelike flowers. It is so spectacular it needs careful placement lest it overpower the rest of the garden.

Successful broad-leaved evergreen flowering trees are none too common in this area. One

of the finest, however, is *Eucryphia x nymansensis*, a slow-growing dark green pillar of a tree which brightens August with its white honey-scented flowers. It needs protection from cold winds, but is well worth the effort.

A great favorite with Pacific Northwestern gardeners, sourwood (*Oxydendrum arboreum*) blends well with rhododendrons and native trees and shrubs. A small tree to thirty or forty feet tall, it has tiny white bells arranged along fingerlike clusters that extend beyond the cool green foliage.

Late Summer

Finally, in mid-to-late August, the pink-flowered silk-tree (*Albizia julibrissin 'Rosea'*) opens its powder-puff blossoms, competing with the Japanese angelica tree (*Aralia elata*) for attention. Both have a spreading habit and several times compound leaves; however, the latter's blooms are carried in great white clusters (panicles) followed by dark purple "berries."

February through August is a long flowering period. By September, we are ready for autumn color. Then our rainy winters begin, a time to look forward to the first flowering trees of next spring. 

CONSPICUOUS FLOWERING TREES IN CALIFORNIA

Philip E. Chandler

The greatest number and variety of flowering trees are found in the densely populated areas from Goleta and Santa Barbara southeast through San Diego from coast to mountains. Here there is little winter chilling, irregular rainfall even in winter, vacillating humidity, constant need for irrigation, and long dry summers with cool nights. The plants on the following list are cultivated in this region.

Many can be found beyond this area, but as one travels north and inland the treelike oleanders of La Jolla, for example, remain shrubs in Chico and Redding. Yosemite Valley features dogwood and native redbud; high desert—Joshua trees; low desert—fruiting date palms, grapefruit, mesquite, and brilliant cactus. And the San Francisco region supports a rich accumulation of temperate-zone trees alongside marine subtropicals (*Clethra arborea* and *Magnolia campbellii*) which require less sun but tolerate little frost.

Suggested Trees and Shrubs

***Bailey acacia** (*Acacia baileyana*): bright yellow cottonball flower clusters usually in January; 25' evergreen tree, gray-green, drought tolerant. **Silver wattle** (*A. decurrens* var. *dealbata*): flowers similar, February, tree larger, rootier, longer-lived, leaves gray, fern-like. **Green wattle** (*A. decurrens*): electric yellow flowers, leaves sage green, tree round-crowned, uncommon.

Black wattle (*A. mearnsii*): paler fragrant flowers, intermittently March–June; tall gray-green brittle tree; uncommon. **Pearl acacia** (*A. podalyriifolia*): lemon yellow flowers November–February; drought tolerant; tree small, shrubby. **Willow acacia** (*A. saligna*): showy deep yellow flowers in March, leaves broader; conspicuous on freeways.

Lilly-pilly tree (*Acmena smithii*): pink-lavender or near-white marblelike fruits conspicuous throughout winter on evergreen round-topped tree; to 25'.

*Most commonly planted.

Red horse-chestnut (*Aesculus carnea*): upright spikes of pink to crimson flowers April–May; 30' deciduous tree, leaves large, compound; more common inland and north.

Silk-tree (*Albizia julibrissin*): powder-puff flowers pale salmon to vivid pink June–July; tree flat-topped, deciduous, to 25', leaves fernlike; best inland, hardy.

***Hong Kong orchid tree** (*Bauhinia blakeana*): wine-red orchidlike flowers especially in early winter; tree small, evergreen; leaves kidney-shaped. *B. forficata*: butterflylike white flowers; summer, tree small, essentially deciduous. **Purple orchid tree** (*B. variegata*): lavender-pink orchidlike flowers, occasionally white, spring; best away from ocean.

Australian flame tree (*Brachychiton acerifolius*): electric orange-red flowers late spring, tree semideciduous; to 40'; flowers best away from ocean. **Queensland lacebark** (*B. discolor*): pink bottle tree; rusty-pink flowers intermittently; tree semideciduous, 40'.

Tara (*Caesalpinia spinosa*): yellow flowers, red beanlike fruits mostly in winter, spiny evergreen; to 25'; uncommon.

***Common red bottlebrush** (*Callistemon citrinus*): bright red brushlike flowers, copious, appear intermittently; tree evergreen to 15', foliage often chlorotic. ***Weeping bottlebrush** (*C. viminalis*): red flowers pendent, leaves and tree superior to preceding.

Cape-chestnut (*Calodendrum capense*): large-clustered, lavender-pink flowers late spring; tree to 30', evergreen.

Crown-of-gold tree (*Cassia carnavaletii*): large-clustered yellow flowers, autumn, tree 20', semideciduous. ***Gold medallion tree** (*C. leptophylla*): brilliant yellow flowers late summer, tree essentially evergreen; to 25'.

Eastern redbud (*Cercis canadensis* 'Forest Pansy'): magenta pea flowers on maroon stems appear before leaves; new foliage purple-bronze; tree round-topped, 20'.

Chinese fringe tree (*Chionanthus retusus*): massed clusters of white fringelike flowers late



Bright yellow flowers and gray-green fernlike leaves make the Australian silver wattle (*Acacia decurrens* var. *dealbata*) a good choice for coastal Southern California.

spring, deciduous tree; to 20'; best where some frost; uncommon.

***Floss silk tree** (*Chorisia speciosa*): purplish-pink to rose red hibiscuslike flowers October-January; trunk usually spiny, green to gray; widely planted.

Pink ball dombeya (*D. x cayeyxii*): rose to crimson flowers in hanging clusters early spring; tree to 50', evergreen, uncommon.

***Coastal kaffirboom** (*Erythrina caffra*): deep red-orange tubular flowers in large clusters on bare branches January-March; tree to 40' and across; widely planted. ***Naked coral** (*E. coralloides*): bright red spike flowers on bare branches, spring, leaves appear later on unusually shaped branches, widely planted. ***Cock-**

spur thorn (*E. crista-galli*): coral to red pealike flowers borne in large clusters in spring, repeat in summer, fall; small wide-headed tree, common. *E. falcata*: flame red flowers borne in large clusters, late spring, on mature trees only; largest tree of genus, evergreen, uncommon.

***Natal coral** (*E. humeana*): orange-red flowers in upright spikes, summer; tree deciduous. **Kaffirboom** (*E. lysistemon*, *E. princeps*): fiery red-orange flowers on bare spiny branches spring or anytime, foliage often sparse; not common.

E. speciosa: crimson spiked flowers fall to spring on small thorny deciduous tree; leaves large, woolly; rare. *E. sykesii*: brilliant orange-red flowers spring and intermittently; recently introduced here, scarce to date.



Crepe-textured flowers in many colors are prominent on the thrusting branches of the crape-myrtles (*Lagerstroemia indica*).

***Flame eucalyptus** (*E. ficifolia*): bright red or pink, cream, rose, orange flowers in large clusters, summer and intermittently; tree roundheaded, dense, to 30', common especially near coast. **Red ironbark** (*E. sideroxylon*): flowers pink to red, mostly winter; 40' tree, evergreen, bark dark red, fissured, leaves gray-green, reddish in winter, common. **E. macrocarpa**: small rose to crimson flowers conspicuously massed intermittently throughout the year; small shrubby tree.

***Silk-oak** (*Grevillea robusta*): comblike orange-yellow flowers light entire crown late spring; trees evergreen, tall, brittle, messy.

Tulipwood tree (*Harpullia arborea*): lavish orange pods in pendent clusters contrast with shiny black seeds autumn into spring; evergreen compound leaves cover rounded crown, to 30'; rare.

***Sweetshade tree** (*Hymenosporum flavum*): pale to deep yellow fragrant flowers adorn narrowly upright open evergreen; to 25'; April-June; widely planted.

***Jacaranda** (*J. mimosifolia*): vivid lavender-blue tubular flowers in giant clusters cover

leafless crown in May-July; perhaps most popular flowering tree, fast-growing standard or multistem; to 40' and across; leaves fernlike after flowers.

***Crape-myrtle** (*Lagerstroemia indica*): pink, white, crimson or rose purple crinkled crepelike flowers in upright clusters cover top of small deciduous tree late summer into autumn; thin, smooth trunk and branches mottled pinkish cream to pale brown; leaves colorful in autumn; hardy; widely planted inland; mildews in fog belt.

Primrose tree (*Lagunaria patersonii*): pale pink flowers like small hibiscus abundant mid-summer or intermittently; tree narrowly and densely upright; to 50'; leaves gray-green; useful at beach, hardy inland; common in established gardens; scarce in trade today.

Glossy privet (*Ligustrum lucidum*): large upright clusters of small white flowers cover crown June-August; especially valuable high desert, hardy, useful anywhere; evergreen leaves dark, glossy.

Tulip-tree (*Liriodendron tulipifera*): flowers pale orange and chartreuse, cuplike, abundant

early summer; one of most versatile deciduous eastern American trees well adapted to southern California; more common north and inland.

Yulan magnolia (*M. heptapheta*, *M. denudata*): pure white cuplike flowers cover bare limbs late January (later in colder areas); possibly finest Chinese magnolia for southern California; now rare, seldom grown. ***Southern magnolia** (*M. grandiflora*): large cream-white fragrant flowers April–August and intermittently, framed by leathery glossy dark green leaves velvet brown beneath; tree 30–40', rooky, hardy, adaptable and widely planted; numerous cultivars, some dwarf. ***Saucer magnolia** (*M. x soulangeana*): purplish pink to wine and near-white flowers usually massed, appear in February but occasionally November–March; many cultivars; hardy, widely planted. **Veitch magnolia** (*M. veitchii*): very large flowers, rose at base to white at tips; February; tree to 35' and across; well adapted to low-chilling areas.

Markhamia hildebrandtii: lemon yellow trumpet flowers in loose clusters midsummer; for mildest areas only; purple-tipped dark green compound leaves bronze in winter; rare.

Flaxleaved paperbark (*Melaleuca linariifolia*): massed white brush flowers cover crown May–June, most conspicuous of the numerous white bottlebrushes; leaves linear, dull gray-green, dense.

New Zealand Christmas tree (*Metrosideros excelsus*): copious clustered dark red brushlike flowers glow from gray-green rounded crown May–June; tree to 30' grows slowly, best near seashore, tender inland.

Oleander (*Nerium oleander*): white, pink, red, salmon, or yellow flowers cover small tree 10–20' June to October, line freeways, mass planted on banks and terraces in any soil wet or dry; one stem standards adorn small gardens and containers; the single white form blossoms earliest, latest, longest; drops spent flower clusters.

Mexican palo verde, Jerusalem thorn (*Parkinsonia aculeata*): fragrant yellow flowers in loose pendent clusters appear summer to fall intermittently; green-barked spiny, spare tree, multistem, leaves yellow-green; common inland and desert areas.

Empress tree (*Paulownia tomentosa*): large lavender trumpet flowers in ten-inch clusters early spring; large heart-shaped leaves, hairy, deciduous; tree to 30', uncommon, valuable in colder areas.

Peltophorum dubium: brilliant yellow crepe-like flowers in upright clusters August–September; tree large, essentially evergreen, leaves fernlike, red-stemmed; rare.

***Victorian box** (*Pittosporum undulatum*): massed small creamy white flowers very fragrant late winter, spring; tree 30', dense, fast growing, drought tolerant; widely planted.

Taiwan cherry (*Prunus campanulata*): electric rose-red bell-shaped flowers profuse mid-February, tree to 20'; best flowering cherry for southern California. **Cherry plum** (*P. cerasifera*) (numerous cultivars): pink, white single or double flowers profuse, February through April depending upon variety; deciduous purplish-bronze leaves dull mid-summer on; widely grown; valuable colder areas.

***Evergreen pear** (*Pyrus kawakamii*): massed white flowers on almost leafless branches November–February depending upon site and season; tree to 25', semideciduous, very prone to fire blight; widely planted.

Robinsonella cordata: conspicuous lavender-blue hibiscuslike flowers on slender evergreen tree, occasionally encountered but no longer propagated.

African tulip-tree (*Spathodea campanulata*): spectacular red orange and yellow tuliplike flowers in gaudy terminal clusters August–October; tender, fast growing, large trees essentially evergreen; leaves compound, very large; uncommon, stops traffic.

***Firewheel tree** (*Stenocarpus sinuatus*): red and yellow flowers in wheel-shaped clusters occur intermittently, especially early autumn; evergreen, glossy, narrowly upright.

Golden trumpet tree (*Tabebuia chrysochroa*): brilliant yellow tubular flowers generously clustered on bare limbs late February–April; tree to 20', deciduous, leaves palmately compound, woolly; grows best away from coast. *T. impetiginosa*: vivid pink tubular flowers in spring on briefly deciduous tree; to 20'; uncommon.

Giant thevetia (*T. thevetioides*): electric yellow three-inch trumpet-shaped flowers illuminate open crowned evergreen 20' tree July–October; uncommon.

***Tipu tree** (*Tipuana tipu*): apricot crepe-textured flowers glow through the light green leafy crown of 30–40' tree in late June–August, fall like confetti to cover ground and walks with soft orange yellow; tree briefly deciduous in spring, arresting for sculptural structure. 



Pittosporum tobira

FLOWERING TREES FOR THE DESERT SOUTHWEST

Fred Widmoyer

Recent immigrants to the "Land of Enchantment" frequently long for the lush greenness of their native state. Here, one soon learns that the choices are not as abundant nor are the selections always the blue ribbon cultivars listed in many gardening publications.

In this land of diverse soils and climate, new gardening techniques and cultivars may be necessary to achieve short periods of colorful flowers. Most of New Mexico's flowering trees, for instance, would be classed as large shrubs or small trees, depending upon the pruning techniques. This is not a serious drawback since most of the houses are single story structures. Alkaline soils prevail in most areas. Temperatures vary mostly because of elevation rather than latitude. Summer month temperatures in the southernmost areas may exceed 100°F, while

high elevation areas may be a comfortable 70°F. Freeze-free seasons vary from more than 200 days to less than 80 days at high elevations. Precipitation is variable, usually from 10 inches or less over much of the southern desert and the Rio Grande and San Juan valleys to more than 20 inches at higher elevations in the State. This means that intensive care must be given to all new plantings and the established plants benefit from regular care—irrigation, mulch, fertilizer and insect control. Seldom do diseases present insurmountable problems. Many of the trees grown in other areas may be only one-half to two-thirds the height here, even with the best of care.

Native Trees

A native New Mexico species, the **desert willow**

(*Chilopsis linearis*) grows either as a large shrub or a small tree which seldom exceeds 15 to 20 feet in height. In order to develop a tree, judicious pruning is required. It is not a willow, but belongs to the same family as catalpa, although its leaves are long and slender, resembling the true willow. The trumpet-shaped flowers are large and showy, ranging in color from pure white to pink or orchid. It occurs naturally to 6000 feet elevation. Desert willow endures drought, thrives in light sandy soils and is easily transplanted. With adequate moisture, it flowers from June until late summer. 'Hope', a white, and 'Barranco', a lavender flowering cultivar, have been released by New Mexico State University.

In most of the high desert areas of Arizona and New Mexico, **palo verde** (*Cercidium floridum*) is grown with varying degrees of success. Difficulty in transplanting, except from containers, discourages many gardeners. Young trees require staking. The mass of yellow flowers make it striking when in bloom. The stems and leaves are green.

Another native plant, **mescal bean** (*Sophora secundiflora*) has attractive and fragrant violet pea-shaped flowers early in the spring. The pods open later in summer to expose the bright red beans which are extremely poisonous. The distinctive foliage resembles wisteria. It tolerates almost any garden conditions, but requires good drainage. The mature tree may be 20 to 30 feet in height. In most areas, the tree benefits from moderate to deep irrigation. **Japanese pagoda tree** (*S. japonica*) bears white flowers, is attractive and hardy, and tolerates a wide range of soil and climatic conditions, all of which makes it a useful plant in this zone.

Mexican elder (*Sambucus caerulea* var. *neomexicana*) is a partially evergreen species. The owner, by tradition, is to have continued good luck and prosperity. It has a crooked but well defined trunk and grows slowly to a height of 15 to 20 feet. Mexican elder is not hardy and some winter-kill of the smaller branches frequently occurs in southern New Mexico. Flat topped, yellow-white flowers are produced in profusion much of the season. Fruit set is erratic and inconsistent. The wood is brittle. Weedy growth occurs without pruning.

Imports to the Southwest

The **silk-tree** (*Albizia julibrissin*) is a small tree, usually reaching a height of 15 to 20 feet. It is a flat-topped, low-branching, open tree with

light green feathery foliage and delicate pink flowers early in the summer. While fairly hardy, it performs best in the southern irrigated valleys where summer temperatures are high. The seed pods and falling floral parts create a litter problem which should be considered in evaluating this species. Seedlings are usually profuse.

Several of the flowering trees listed occur in other growing areas, which indicates wide adaptability. **Eastern redbud** (*Cercis canadensis*) is an attractive, small spring-flowering tree grown in most areas of New Mexico. Here it seldom reaches a height of 15 feet. Once established, it is quite drought-resistant and hardy. It is susceptible to root rot, particularly in the heavier soils.

The **Russian-olive** (*Elaeagnus angustifolia*), not often found on recommended lists, offers hardiness to drought and cold once established. Growth seldom exceeds 15 to 20 feet. The yellow flowers are somewhat inconspicuous but are fragrant. An introduction by NMSU, 'King Red' was selected from *E. a. var. orientalis*. The fruit is red and used as food by many kinds of birds. The honey is of excellent quality. Pruned specimens are picturesque.

The **china-berry** (*Melia azedarach*) is a frequently overlooked tree for arid areas. Many forms are available, but the 'Umbraculifera', or Texas umbrella tree, has an erect trunk, topped with a canopy which casts a dense shade. Numerous clusters of purple-to-lavender flowers are followed by berries. This is one of the better trees for alkaline soils. The wood is brittle, so attention to pruning is required to prevent wind damage. The species is resistant to most insects and diseases. Sometimes cotton root rot is a problem.

Various **photinias** are grown in the warmer climates, even though they tend to have chlorosis, particularly in alkaline soils. They offer not only flowers in the spring, but also copious new growth and some red leaves and berries in the autumn. Good air circulation reduces powdery mildew and spider mite infestations. This is one of the few broad-leaved evergreens for the area. Applications of chelated iron and zinc along with regular care assures a more handsome tree.

Another broad-leaved evergreen is **Pittosporum tobira**, a small tree to 15 feet. Depending on pruning, the tree can be grown either single or multistemmed. The creamy white flowers fill the air with the heavy scent of citrus.



Russian-olive (*Eleagnus angustifolia*) in relief against a wall displays its refined glaucous foliage and graceful branching structure.

Aphids frequently disfigure the new developing leaves and sometimes sunburn and chlorosis are evident. Most years a heavy set of berries occurs, which turn blue at maturity.

Two prunus species are found in New Mexico landscapes. The **flowering plum** (*Prunus cerasifera*) is most widely planted because of its pinkish flowers and reddish-purple foliage. Mass and clump plantings are popular. The trees may grow to 25 feet. **Flowering peach** (*Prunus persica*) is one of our few double-flowering species. Trees seldom exceed 12 feet in height. The chief advantage is the flower color range of white-to-red. For best results select from various flowering periods. This group of plants is generally short lived, exhibits iron chlorosis, cytospera canker and the multitude of problems that attack the other stone fruits.

The **black locust** (*Robinia pseudoacacia*) is a rapid growing tree suitable for an area where it can reach 35 to 40 feet in height. The more popular, 'Idahoensis', has pink flowers. Most lists

place this tree as an alternate or special use tree because of its thorns, invading roots, brittle wood, numerous pests, suckers, chlorosis, root rots, mistletoe and bean litter. The fragrance and quality of honey produced are favorable attributes.

Flowering crab-apples are among the finest small trees for early spring color. Literally dozens of species, hybrids and varieties are available. The choice is one of individual taste for flowers, fruit or leaf color. As a rule, crab-apples are easy to grow, require little pruning, and are adapted to a wide range of soil conditions. They are susceptible to the same disease and insect pests of the commercial apple, but precise control usually is not critical. Many of the new cultivars should be used, but unfortunately many nurseries and garden centers stick to the older and tried ones. Use the ones known for their resistance to pests. Excellent check lists are available and can be obtained from your extension agent or garden center personnel. ☘

PLANTING AND CARE OF FLOWERING TREES

Kenneth D. Cochran

The planting season for flowering trees is determined by the condition of the root systems. Flowering trees are marketed in several forms including bare-root, balled-and-burlapped, container-grown and packaged. It is best to plant bare-root and packaged trees when they are dormant in the spring. Balled-and-burlapped or container-grown trees can be planted in spring, summer or autumn if the species or cultivar selected is adaptable to planting during these seasons.

In cold winter areas, some species planted in the autumn do not re-establish a root system in the transplant site before the ground freezes. Flowering trees in the Rose and Magnolia families have the best survival rates if they are transplanted in the spring before growth begins. In warm winter areas, spring and autumn plantings are recommended if new root growth will begin before seasonal changes of summer and winter.

Climate and soil are two elements of the environment that determine the location of flowering trees in the landscape. These factors should be applied to specific species and cultivar selections to ensure successful planting.

The climatic conditions of light, temperature and moisture in which flowering trees will be growing have an effect on the development of the trees. These conditions are often the limiting factors in the growth of the trees, as they affect their potential to produce a food supply.

Light and Temperature

The trees that grow well in shade are classified as shade tolerant and will initiate and produce flowers in shady locations. Species of *Amelanchier*, *Cercis* and *Cornus* are understory trees, tolerant of shade and will produce a flower crop when situated in partial shade conditions (one-half the day under shade conditions).

The trees that grow best in full sun exposure will not initiate and produce an optimum flower crop in shady locations. Members of the Rose Family, including *Malus* spp. and *Prunus* spp. flower best in sunny locations.

Another sunlight effect is called sunscald. When trees are growing in the nursery, some of the trees shade the tree trunks of other trees for most of the summer day. When the shaded tree trunks are transplanted and receive full sun, the outer layer is killed by sunscald. The damage occurs primarily on the lower one-third of the tree trunk. To prevent sunscald when transplanting trees, the trunks should be wrapped with tree wrap for the first two years to acclimate the trees to their new site.

Flowering trees can be damaged by high and low temperatures and frost. Trees exposed to full sun on hot days are growing under higher temperatures and are more susceptible to drought. Some species wilt under full sun or hot days and therefore are recommended for partial shade situations. *Cornus florida* and *Laburnum x watereri* are examples of trees that should be planted in partial shade.

Flowering trees planted outside the recommended plant hardiness zone would most likely be susceptible to low temperature injury. Low temperature injury includes freezing of the wood, the roots or the flower buds. If the injury does not kill the trees, it may weaken them considerably and affect flower production. Where severe winter temperatures are prevalent, select plants recommended for such hardiness zones.

Trees that bloom early in the spring should not be located in frost pockets (low areas) where cold air accumulates. Species such as *Magnolia x soulangiana* and *Magnolia stellata*, which bloom early in the spring, are often damaged by frost.

Moisture

Most of the growing plant is made up of water, but the plant extracts from the soil much more water than it holds. Water is lost from the plant through the leaf surfaces by transpiration. Some flowering trees are recommended as drought tolerant. Such trees are *Crataegus* spp. and *Pyrus calleryana* cultivars.

When planting flowering trees that are recom-

mended for moist soils into locations that lack adequate summer rainfall, the trees should receive supplementary water to ensure growth and development.

Soil

Soils are often the cause of poor growth. Soil improvements should be made over a large area rather than just the planting hole.

Texture is important. The two extremes in soil textures are soils containing high percentages of clay or sand. Clay soils hold moisture for a longer period of time than loamy or sandy soils. Oxygen is also a limiting factor in clay soils.

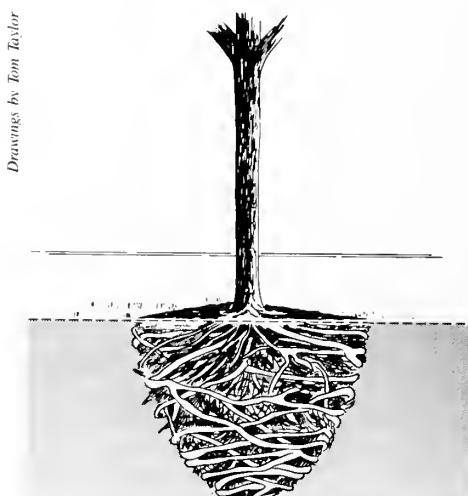
Clay soils can be improved by adding slowly decomposing organic matter such as sphagnum peat. The soil texture will be improved through improving the microbiological activity. With microbiological activity, the clay particles are grouped together into stable aggregates. This will improve drainage, and the clay aggregates will hold water.

The water-holding and nutrient-retention capacity of sandy soils can be improved by adding slowly decomposing organic matter (a five-to-ten percent organic matter content should be maintained in soils for optimum growth and development of the roots). If soils are not amended with organic matter to improve soil texture, tree species tolerant of wet soils should be planted in clay soils and trees tolerant of dry soils should be planted in sandy soils.

The soil reaction or pH is also a factor in

flowering tree selections because some species are specific to acid or alkaline soils. Soil pH may have to be adjusted. For example, *Oxydendrum arboreum* does well in acid soil, while *Cercis canadensis* tolerates an alkaline soil.

Working clay soils when they are wet destroys soil aggregation and thus effects water retention, aeration, drainage and water movement in the soil. When wet soils are walked upon or compacted by equipment, the weight on the soil presses the aggregates together and destroys the structure. The air is also pushed out of the soil and when the soil dries, it is hard and compacted. As a result, water penetration to the roots is limited. To prevent such damage, planting and working of soil should be done when the soil is dry or moderately moist. Compacted soils can be broken up with tillage equipment that slices through the soil layers. Organic matter should be incorporated into the upper eight to ten inches of the soil mass to rebuild soil aggregation. If compacted soils or soils with a hardpan just have a planting hole carved out of them, the hole becomes a sump or water well and results in poor drainage. Most flowering trees grow best in moist, well-drained soils. Too much water can also be a problem. If soils become waterlogged during periods of heavy rainfall, the plantings should be located so that excess water can be drained away. Improving soil drainage may be accomplished through installation of drainage pipe at the time of planting.



Drawings by Tom Taylor

Fig. 1. Planting a tree in a hole where the surrounding soil is not adaptable to root penetration will result in girdling (encircling) roots.

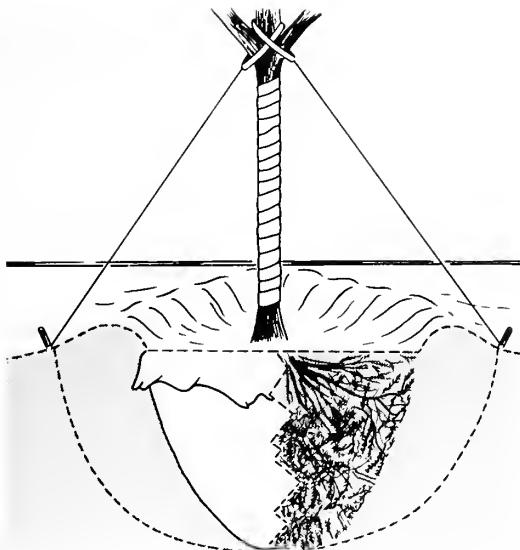


Fig. 2. In transplanting flowering trees, the root system should be reestablished in a soil of good tilth and a planting site where the roots can grow and develop. The planting hole should be sixteen to twenty inches wider than the diameter of the root system. Set on firm soil and at the same depth as it was growing before transplanting. After the tree is set in the hole, materials which are not readily biodegradable should be removed from around the root ball. A collar of soil should be placed at the top outside edge of the root ball for containing water. The planting operation is completed when the tree is watered, wrapped, and guyed.

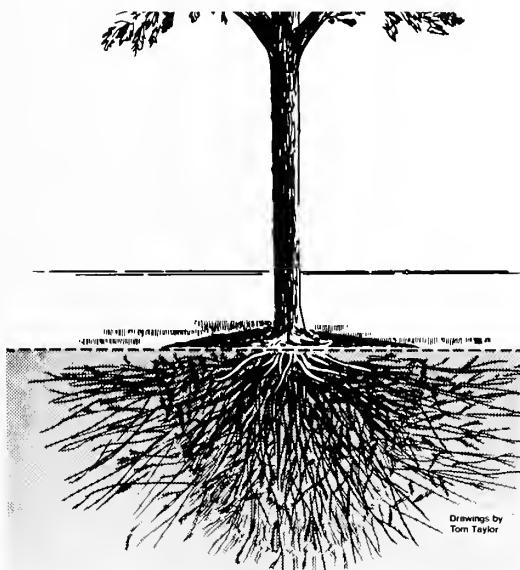


Fig. 3. If the tree has been correctly sited and planted, the root system will extend into the surrounding soil area (two years after transplanting).

Preparation of the Planting Hole

The width and depth of the planting hole depends on the size of the root system being transplanted and the existing soil conditions. If the soil area where the tree is to be planted is of the correct texture, the width of the planting hole should be sixteen to twenty inches larger than the diameter of the root system. This will allow for a prepared backfill for the new root to grow into soon after transplanting. Eventually the roots will grow into the surrounding soil area.

The root system develops best when set at the same depth as it was growing before transplanting. In balled-and-burlapped or container-grown plants, the roots with soil around them should be set in the hole on firm soil to prevent settling of the tree.

The walls of the hole should be roughened with a spade to lessen the container-effect of the planting hole and the possibility of girdled root development. If poor soil conditions exist around the planting hole, there are two options: prepare a larger area or select tree species that will adapt.

Roots grow from the root tips, and remain in the position placed when transplanted. The roots of bare-root or packaged trees should be distributed in the planting hole. Container-grown trees should have any encircling roots pruned before planting. The object in transplanting is to reestablish the root system in a new planting site.

After the tree is set, the wire baskets and lacings around the root ball of balled-and-burlapped trees should be removed. These materials are used to support the root ball in transplanting and may not be biodegradable. Rot-proof burlap and plastic wrappings should also be removed.

Backfilling Around the Tree Roots

Backfill should be amended with partially decomposed organic matter, and is best handled when dry or slightly moist. A well prepared backfill should be firmed in place around the roots.

A basin for watering should be made with a collar of soil at the finished grade of the tree and at the edge of the existing root system. The collar of soil will direct water to the roots of the tree rather than to the backfill.

Planting is complete when the tree is watered, wrapped and guyed. The tree must be well watered (after backfilling) by allowing water to

percolate down to the root system through the basin. The collar of backfill should be maintained for a full growing season to prevent runoff of applied water. Mulch with organic matter to conserve moisture.

Wrap the tree trunk from the ground level up to the first branches with a protective tree wrap to prevent sunscald. Guy the tree to prevent wind damage until the new roots are established (two growing seasons later). Guy wire supports wrapped in rubber (old garden hose) and loosely looped around should support the lower one-third of the tree so the top of the tree is free to move and develop. [Three guys, each six to eight inches from the other, will give good resiliant support yet distribute stress so the tree won't snap off at the guys in a high wind.]

Care of Transplanted Flowering Trees

The leaves of the flowering tree produce sugars through photosynthesis and the sugars aid in flower production. Therefore, a well-produced foliage crop during the growing season will increase the production of flower buds.

Root growth accelerates in the spring before bud break and continues to grow even after leaf drop in autumn. Maximum root growth occurs in spring and autumn when soil temperatures and moisture are most favorable.

Watering should be deep into the root area of the transplanted tree. This will establish a water reservoir for periods of drought. It will also encourage a deep root system to anchor the tree.

The need for water can be estimated by feeling the soil or by using a soil moisture meter instrument. During the first two years after transplanting when the rainfall is less than one-half inch to one inch per week, additional water should be provided. When watering, the rate of application should not exceed the rate that water can soak into the soil. Mulch over the root system to conserve moisture and to moderate soil temperatures. [Do not mulch with peat moss; it forms a nearly-impenetrable barrier to water when it dries.]

Fertilization

Trees need fertilizer to produce root and top growth. Apply before growth begins in the spring which will allow the nutrients to be available to the plant when growth begins. Nitrogen is the primary nutrient needed although potassium and phosphorus are also important; a balanced fertilizer benefits roots and flowers as well as leaves. 

DESIGNING WITH FLOWERING TREES

Robert E. Ford

Although there are countless varieties of trees and shrubs to use in creating a landscape plan, flowering trees are among the most spectacular. Their selection and placement must be carefully planned according to basic principles of design to produce a quality landscape. If executed properly, the result can be a work of art.

Flowering trees obviously have many attributes: color, fragrance, unusual forms, fruiting characteristics and a variety of textures. All of these components allow the designer to utilize them in creating special circumstances to enhance the landscape. On the other hand, careful attention must be paid to some of the potential liabilities, including insect and disease susceptibility, hardiness, drainage, soil conditions, exposure, size restrictions, flower and fruit production, availability and adaptability.

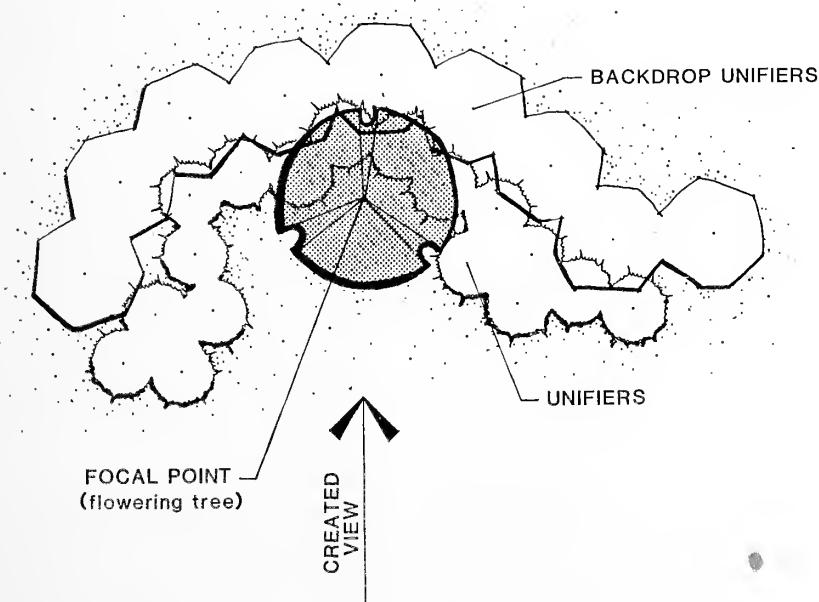
How does one begin to design with flower-

ing trees? The use of ornamentals should adhere to what is referred to as the "design process." This involves three basic steps: research, analysis and synthesis. What this process achieves is to integrate the site's characteristics with the users' needs. The result is an environmental "fit" between site and use.

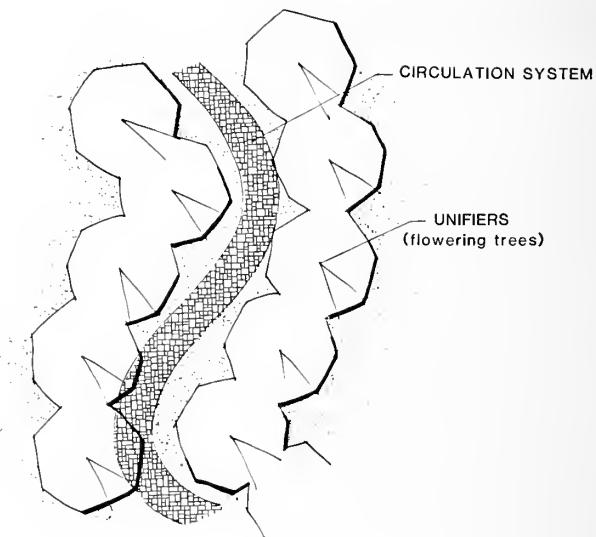
The process begins with researching all that is known about the site to be planted. Investigate what kind of soil, topography, climate, and existing vegetation is present as well as placement of above ground and underground utilities. Zoning restrictions and local laws might also be taken into account.

After researching begin analysis. The analysis provides information to make value judgments. It allows the designer to begin making general, but factual, statements about the site. For example, if an area is low, wet and protected, only

Drawings courtesy of the author



FLOWERING TREE USED AS A FOCAL POINT



FLOWERING TREES USED AS UNIFIERS

certain plants will adapt. On the other hand, an area might be high and dry, and subjected to extreme winter conditions, so more hardy plants should be used. The completion of the analysis gives information as to the best flowering trees for the particular site.

Finally, the design is evaluated in light of the site analysis. The result of this important phase ends in the formulation of a design idea, or "a concept." This is an integration of the user's needs and the site's capacity to accommodate them. The concepts can be refined into a single design approach represented by a drawing known as the master plan. When this is done then the following four functions which plants, and especially flowering trees, serve in the landscape can be addressed.

Architectural functions: Flowering trees and other plants can be used architecturally to create vertical barriers and horizontal planes and so define outdoor spaces or screen views. Three planes—overhead, vertical and ground—have been identified to assist in creating any outdoor space. Small flowering trees are sought for vertical eye-catching uses, while large flowering trees are sought for their overhead canopies.

Practical functions: In many instances, flowering trees can be used for a functional purpose. For example, flowering trees can be grown

for their fruiting characteristics which also attract birds and small animals. If wind or water erosion is a severe problem, then root systems can assist in stabilizing certain slopes. They can also direct pedestrian traffic and/or reduce glare and reflection from parked cars or buildings as well as block or reduce noise. All of these functions, including fragrance, become very practical uses of flowering trees in the landscape.

Climatological functions: The human comfort zone is approximately 70-75°F. Flowering trees can help obtain this comfort range by affecting temperature, solar radiation, air movement and precipitation. They may not be of an unusual advantage here, but can serve in this capacity as effectively as most others.

Aesthetic functions: Here flowering trees are supreme. Their visual beauty and aromatic character allow them to create a landscape which has for centuries inspired the poet, painter and philosopher.

The variety of possible flowering trees to use can seem overwhelming. However, there are some basic principles which can guide in selecting the proper flowering tree to fit the space and mood. The following illustrates some of the key elements a designer should look for when selecting the proper flowering tree.

Unity: The design needs a degree of repeti-

tion of form. For example, deciding to line a walk or drive on both sides with a row of flowering crab apples of similar size, form and color would provide a repetition and begin to unify the design. In contrast, a varied selection without similar habit, form, color or size would actually detract.

Variety or contrast: If everything were unified, the design can become boring and repetitious. At this point, the designer should consider variety. Many times the flowering trees can be most effective when used as a contrasting element within the design. A specimen or "focal point" is provided when a flowering tree is displayed as an individual; all other plants become secondary unifiers, while the emphasis is focused upon the flowering tree which is carefully selected as the accent. Scale can vary from a solitary horse-chestnut (*Aesculus hippocastanum*) placed on open green to a Washington hawthorn (*Crataegus phaenopyrum*) interspersed with a mass border planting.

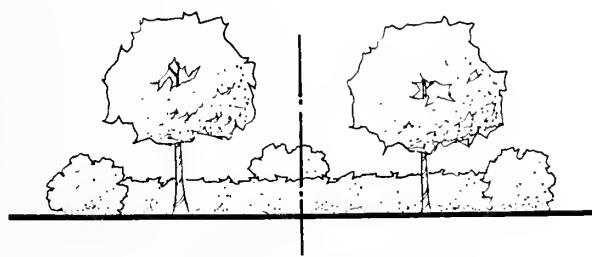
Balance: If the design is to succeed, it must incorporate some degree of balance. Recognizing there are many types of balance, such as symmetrical, asymmetrical and radial, it should follow that one must carefully select flowering trees that do not compete too much. The design should have a main idea or "theme" and concentrate on a specific palette of plants. An example might be an asymmetrical or equal number of flowering dogwoods (*Cornus florida*)

in an informal arrangement on each side of an open green. The design is casually balanced yet provides a sense of equilibrium. Another type of balance is very symmetrical and formal. This controlled design might produce straight lines of flowering trees with an axis as the heart of the design. This type of design is displayed in grandiose fashion in France at the Palace of Versailles. The "line" becomes dominant and directs your attention toward a terminus or end.

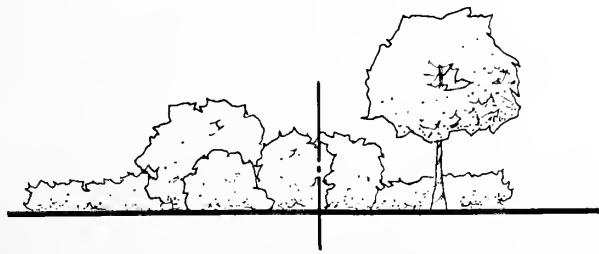
Scale and proportion: Scale is an important element in design. Many flowering trees grow at different rates. Be sensitive to the ultimate height and width of the tree. However, also be aware of the growth rates of various species. Essentially, compare plant sizes and growth rates before selecting the combination of trees.

It is important to try to proportion the trees with the others so a large tree is in scale with others of less significance. Usually, planting an "odd" number of the same species will lend the design an asymmetrical balance and proportion that appears comfortable to the eye as long as the smaller trees are placed in the foreground and larger trees in the background.

Visual Character: The visual character of a flowering tree design in the landscape is somewhat subjective, but once again, certain basic elements become paramount. There are five essential elements that afford quality in a design. They are color, form/shape, texture, material selection, and light or shadow.



SYMMETRICAL BALANCE



ASYMMETRICAL BALANCE

Based on these five elements, the entire aesthetic design rests. Careful selection and placement of these elements in accordance with the previously mentioned principles will produce an exciting and vibrant environment.

Blooming patterns of the flowering trees become very important in regard to color selection and assisting in unifying the design. As an artist selects the colors for the canvas, the designer selects the colors for the landscape. The fruit, bark and seeds must also be considered as color accents when selecting species; however, foliage is usually a major criterion because of its presence during the greater part of the year. The purple-leaf plum for example, offers a unique contrast, not only with its beautiful pink flowers, but for its deep purple foliage. It serves as an accent plant and special focal point in a planting design throughout the summer season—the flowers almost seem a bonus.

The shape or form of a flowering tree can be thought of as its habit or silhouette. Those trees which have strong, vertical habit will draw one's eye and demand more attention than other more rounded or horizontal forms. There are some that weep, are vase-shaped, or irregular or

espalier or "trained form"; each can offer variety. The form must be considered as an equal portion of the design composition.

Textures of flowering trees are considered primarily when one approaches the tree. The closer or more intimate the setting, the more dramatic the texture becomes. For this reason viewing distance becomes a major factor. The various parts of the tree become evident when considering bark texture—whether it is smooth, rough, peeling, colorful or shiny. Fruiting characteristics also are interesting and enjoyable, especially the edible fruits—apple, peach, pear and cherry.

Material selection refers to the plant species as well as the building materials such as brick, concrete and wood. All of these materials must be coordinated for good color, form and texture compatibility. A carefully planned combination of materials will produce a unified design.

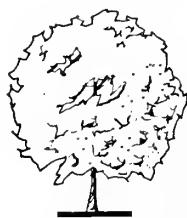
Finally, the placement of the design elements will cast shadows. These shadows can prove functional as well as delightful. How well shadows are utilized can make the difference between a good and brilliant design. Flowering trees can be an integral part of the entire landscape composition. *



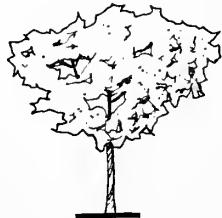
COLUMNAR



IRREGULAR



ROUND



VASE



WEEPING

FLOWERING TREE FORMS



White flowering crab-apple

BRANCHING STRUCTURE, FORMS, AND FOLIAGE

Clarence E. Lewis

When selecting trees, flowers are not the only reason—trees have many other lasting points of interest. Foliage patterns and textures, sheltering canopies, branching structure (see facing page), single or multiple trunks, bark colorations and textures are landscape features which also should influence your choices.*

Tree Canopies and Foliage

Look skyward to tree canopies, which are often works of art. Consider the very fine foliage of the silk-tree, *Albizia julibrissin*, which appears on lateral branches, and is a delicate display which is most pleasing. The species does have problems, and so disease resistant cultivars such as 'Charlotte' and 'Tyron' are recommended, but even these are best used where winter temperatures do not go below 0°F. The many tender acacias, or wattles, for Zone 9 are in this category, as is the larger-growing jacaranda, which flaunts beautiful blue-to-violet flowers

over artful, broad-spreading branches, complemented by delicate leaves.

In the more northern states the elaborate compound foliage of golden-rain tree, *Koelreuteria paniculata*, has a claim on artistry. A recent introduction, 'September', is less cold-hardy than the species, but, as the name indicates, it flowers a month later and displays the same fascinating leaflets.

Endowed with an intriguing almost vase-shaped habit and delicate compound leaves is the late summer-flowering Japanese pagoda tree, or scholar tree, *Sophora japonica*. The cultivar 'Regent' is faster growing, and, like the species, becomes a tree of fifty feet or more.

American yellowwood, *Cladrastis lutea*, extends its loose leaflets over a rounded head, and hangs them on the perimeter, often alone, but very much a part of the upper canopy.

Multiple-stemmed trees can play an important role in many plantings. They can provide needed weight, visual interest and balance. An occasional tree in the landscape that has several ground stems may complement both shrubs and other trees.

*See BBG Handbook #99, *Nursery Source Manual*, for descriptions of both common and unusual trees and shrubs.

The unusual devil's-walking stick, *Aralia spinosa*, and its Japanese relative, *Aralia elata*, display compounded tropical-appearing green foliage sprays over an umbrella form of many basal stems. Aralias may seem to be a weed to some people, but to the landscape artist with imagination they can add a necessary touch.

Unusual Bark

Flowering trees with attractive bark add their favorable influence, especially in winter. Those with a variety of textures and mottled, colorful barks include kousa or Japanese dogwood, *Cornus kousa*; Korean stewartia, *Stewartia koreana*; Japanese clethra, *Clethra barbinervis*; Japanese tree lilac, *Syringa reticulata*; and Japanese stewartia, *Stewartia pseudocamellia*.

The black bark of eastern redbud, *Cercis canadensis*, with its array of curved stems is most attractive and so is the checkered, rugged bark of flowering dogwood, *Cornus florida*. Smooth gray bark, often with vertical markings, welcome the shadblows or serviceberries, the most striking being the Allegheny serviceberry, *Amelanchier laevis*, and the Carolina silverbell, *Halesia carolina*. The smooth gray barks of American yellowwood, *Cladrastis lutea*, the eodias and several magnolias lend themselves to being trained as multistemmed trees.

The Branching Habit

Branching structure has a strong influence on not just how the flowers are displayed, but on the trees and shrubs nearby. Flowering dogwood is especially noticeable this way. Side branches taking the lead and curbing terminal growth is known as sympodial branching. The growth habit becomes more and more horizontal; seemingly, the tree's arms reach out to invite your attention. As it gets older the Japanese dogwood grows somewhat the same, but during the early years the habit is more upright. Lacking the colorful bracts typical of dogwood flowers, but with a full repertoire of armlike branches is the pagoda dogwood, *Cornus alternifolia*. The cockspur hawthorn, *Crataegus crus-galli*, and its thornless cultivar 'Inermis', show horizontal branches of unequal lengths, complemented with glossy leaves and white flowers. The duller leaved dotted hawthorn, *Crataegus punctata*, and its spineless cultivar, 'Ohio Pioneer', are even more artistic in displaying this same growth behavior.

Some flowering trees have a habit of inter-

twining their inner branches. This can be a favorable or unfavorable trait. The good part is the limited twisting and turning aspect which is represented by the serviceberries, American yellowwood and magnolias. The undesirable aspect lies in allowing too many stems to twist, possibly damaging the tree, but a well-guided pair of pruning shears can prevent this.

There is no substitute for interesting tree form for improving the landscape. First, the desired shape must be determined; the final selection of the proper plant becomes secondary.

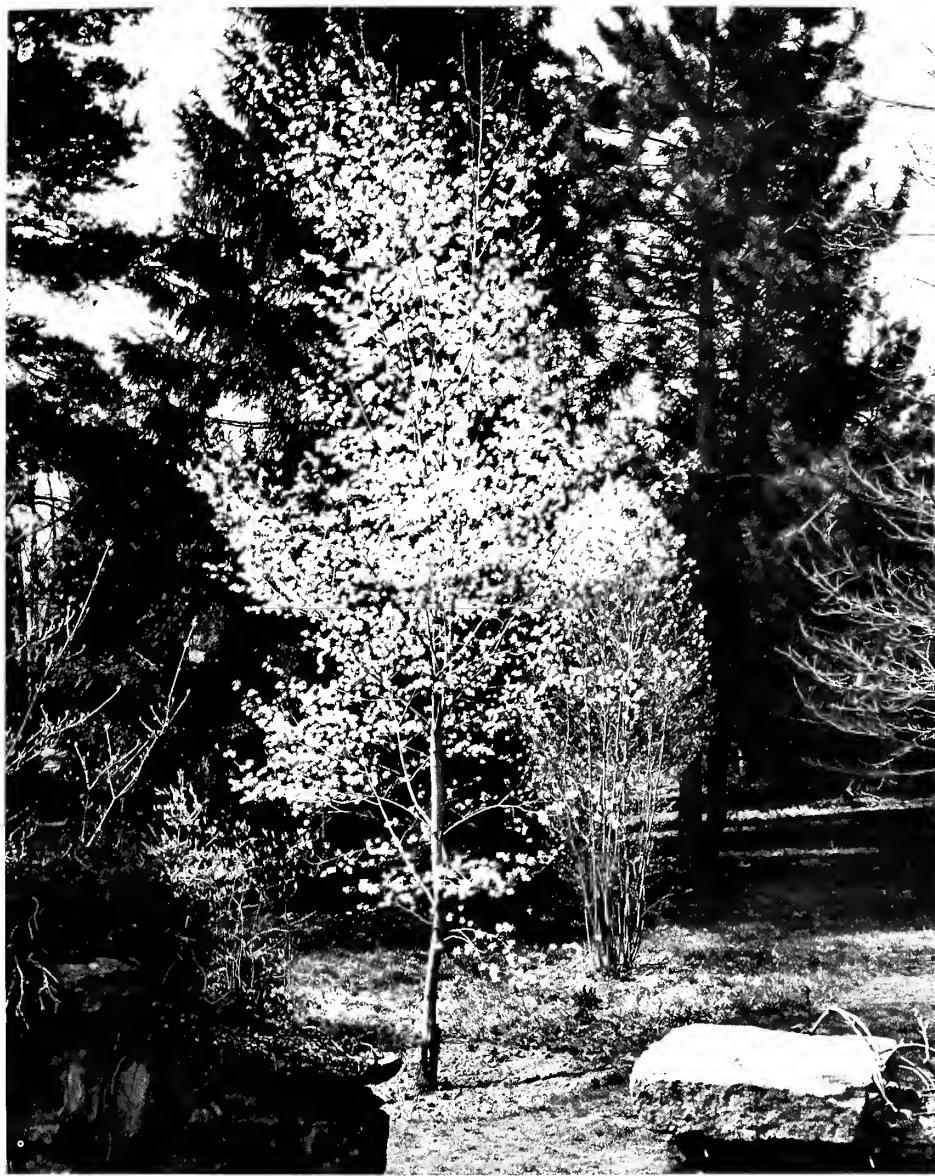
Upright, narrow, or narrow-oval outlines, though desirable, are not common, and some cultivars are difficult to find. Two of the most desirable and available flowering trees are the Milky Way Oriental cherry (*Prunus serrulata* 'Amanogawa'), and the columnar Sargent cherry (*Prunus sargentii* 'Columnaris'). There is still another possibility, the columnar Siberian crab-apple (*Malus baccata* 'Columnaris'), although it is susceptible to fire blight in some geographic areas. Another good tree which remains quite narrow for several years is 'Chanticleer' callery pear (*Pyrus calleryana* 'Chanticleer').

Just the reverse to upright is the weeping form, best represented by the weeping Higan cherry (*Prunus subhirtella* 'Pendula'). There is also a double-flowering form occasionally available locally. The Red Jade crab-apple (*Malus* 'Red Jade'), developed at BBG, is also of weeping habit, but must be watched for fire blight. 'Pink Weeper' crab-apple is broad-spreading and pendulous. Its susceptibility to apple scab is limited mostly to the fruits.

Broad-headed trees are abundant, and there are many from which to choose, including eastern redbud, American yellowwood and magnolias.

V-shaped flowering trees are limited. The most picturesque is the tea crab-apple, *Malus hupehensis*, vulnerable to fire blight, but I would use it regardless, and hope for the best. The flowering cherries with this form are represented by cultivars of *Prunus serrulata*, such as 'Kwanzan', 'Shirofugen', and 'Shirotae'. All these are double or semi-double and all become spreading when older, but still maintain a broad-V branching structure.

Autumn foliage colors should be considered in making selections of flowering trees. The reds, or near-reds, are numerous; the better ones include: flowering and Japanese dogwoods; Oriental and Sargent cherries; sourwood



Smooth light gray bark of this young shadblow (*Amelanchier canadensis*) is characteristic of all amelanchiers and a refined winter feature in a garden.

(*Oxydendrum arboreum*); stewartias; serviceberries; *Franklinia*; Washington hawthorn; and the late-coloring 'Artistocrat', 'Bradford', and 'Chanticleer' callery pears. Yellows should not be neglected—heading the list are eastern redbud, American yellowwood, and the more

pumpkin-colored American smoketree, *Cotinus obovatus*.

Explore flowering trees not just for their flowers but their many other possible contributions. These can result in a more interesting and satisfying landscape. ❁

MAKING SHRUBS INTO TREES— A MATTER OF STYLE

Gary L. Koller

Special garden effects can be obtained by training selected flowering shrubs into small trees similar to plants known as standards. Plants trained in this manner can be used as entry accents, in formal gardens, to end a path, to punctuate a view, or in containers on patios, balconies or terraces. These small trees are often ideal for the condominium garden where they can serve as a focal point as well as adding enclosure for privacy.

Plants selected must be able to be pruned and maintained permanently with one stout stem. While many flowering shrubs can be pruned to one stem, few can be attractively maintained with only occasional pruning.

Selection and Initial Pruning

In looking for the right plant to train, you might review a number of nursery-grown plants. This bit of detective work often reveals one specimen which already has one or two thick stems as well as a number of minor stems. These candidates should be examined and the tallest, thickest stem should be retained, cutting back the other stems to soil level. Alternatively, one can purchase small plants, select one strong growing stem or cane and help it establish dominance by staking it. As the plant grows taller and the stem thicker, gradually remove the lower leaves and branches until you have achieved the optimum stem height. Keep in mind that the presence of leaves and secondary branches low on the stem assist in production of food and other chemicals which increase the rate of trunk thickening. If you attempt to "limb-up" the secondary growth too rapidly, you run the risk of a weak, spindly trunk. In some cases it may be wise to retain the lower bushy branches in order to build up food reserves and to provide nutritional support. When the trunk thickens and the crown becomes bushy, the basal branches can be removed.

Keeping It to a Single Trunk

Once the plant has been pruned to a single stem, secondary buds and branches often arise along

the trunk or from the plant's root collar at soil level. This growth is best controlled as soon as it begins as an expanding bud which can be rubbed off with a finger. Larger, more established growth should be removed using pruning shears.

Occasionally the branch system will grow rapidly causing it to become top heavy. Risk of damage can be lessened by installing a plant stake. The stake should be selected for proper height, sufficient strength and low visibility so that it will not detract from the natural beauty of the plant. Be certain to examine the ties for stem strangulation, and loosen periodically to prevent girdling. In addition, one can selectively thin the growth of the crown, reducing the weight the trunk must carry.

Standard-trained plants can be allowed to develop a loose irregular crown, or if formality is desired, specimens can be clipped to induce a tight crown contoured to fulfill specific design needs. It is difficult both to maintain a full shape and still obtain maximum floral production from a formal style.

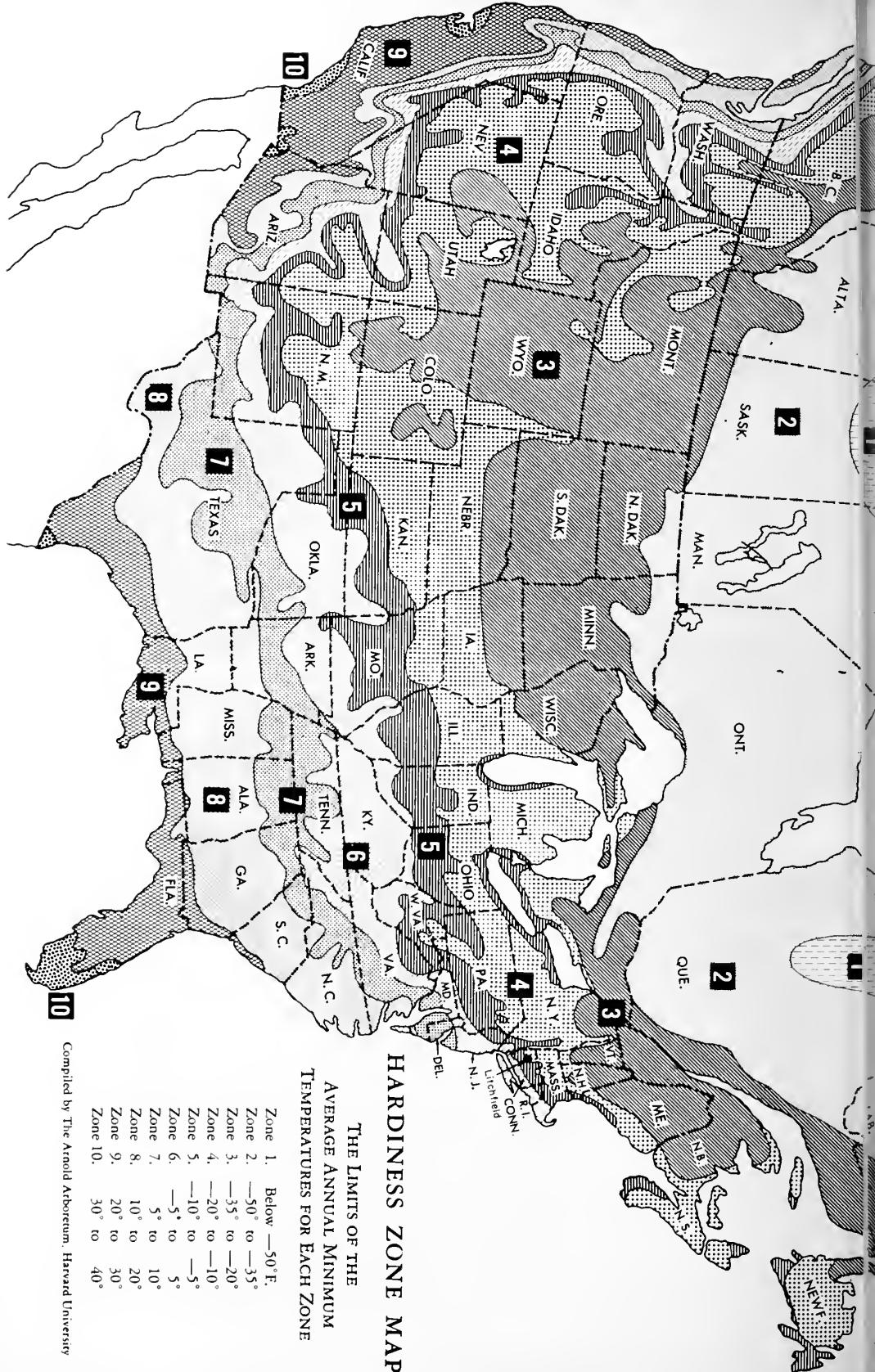
Educated pruning is necessary for clearing the stem of superfluous branches. Keep in mind that you can teach yourself to do this. Many of the principles are similar to the training of a bonsai. The key is to learn a bit about how the plant grows before lifting the pruning shears. If the plant forms blossoms on wood formed during the previous growing season and blooms before mid-summer, it is generally pruned as soon as the last flower blossom falls. If it blooms on new tissue produced during the current season, it is generally pruned during the dormant winter period. Remember that pruning stimulates new growth so that most plants are successful in quickly masking inept or misguided pruning.

While many flowering shrubs can be turned into trees, some do it gracefully while others repeatedly and constantly strive to regain the shrublike character. Be aware of the frequency and severity of pruning required to maintain an attractive specimen. After pruning, some plants

produce rapid, vigorous and lush new growth which requires pruning two, three or more times per growing season. Other species are more easily and attractively maintained with pruning only once a year. If the maintenance needs exceed your commitment of time, energy and interest, perhaps you should allow the plant to grow untrained and as natural as possible.

Following is a list of plants which adapt to a treelike standard. While all are technically flowering shrubs, some were selected for their colorful, attractive fruit more than for stunning flowers:

<i>Aralia spinosa</i> , Devil's walking stick	Zone 5	<i>Forsythia x intermedia</i> , 'Spring Glory'	Zone 5
<i>Aronia arbutifolia</i> 'Brilliantissima', Chokeberry		<i>Franklinia alatamaha</i> , Franklinia	Zone 5
Azaleas (both evergreen and deciduous)	Zone 4	<i>Hibiscus syriacus</i> , Shrub althea	Zone 5
<i>Buddleia alternifolia</i> , Butterfly bush	Zone 5	<i>Hippophae rhamnoides</i> , Sea buckthorn	Zone 3
<i>Camellia japonica</i> , Japanese camellia	Zone 7	<i>Lagerstroemia indica</i> , Crape-myrtle	Zone 7
<i>Caragana arborescens</i> , Siberian pea-shrub	Zone 2	<i>Ligustrum amurense</i> , Amur privet	Zone 3
<i>Caragana arborescens</i> 'Pendula'	Zone 2	<i>Ligustrum obtusifolium</i> , Border privet	Zone 3
<i>Chionanthus virginicus</i> , Old man's beard	Zone 5	<i>Ligustrum vulgare</i> , Common privet	Zone 4
<i>Clethra acuminata</i> , Summer-sweet	Zone 6	<i>Lonicera maackii</i> , Amur honeysuckle	Zone 2
<i>Clethra barbinervis</i> , Japanese summer-sweet	Zone 7	<i>Magnolia stellata</i> , Star magnolia	Zone 5
<i>Cornus alternifolia</i> , Pagoda dogwood	Zone 3	<i>Magnolia virginiana</i> , Sweet-bay	Zone 5
<i>Cornus mas</i> , Cornelian cherry	Zone 3b-4	<i>Malus 'Coralburst'</i> , Coralburst crab-apple	Zone 4
<i>Cornus officinalis</i> , Japanese cornelian cherry	Zone 5	<i>Malus sargentii</i> , Sargent crab-apple	Zone 4
<i>Cotinus coggygria</i> , Smoketree	Zone 4	<i>Osmanthus fragrans</i> , Fragrant olive	Zone 8
<i>Cotinus obovatus</i> , American smoketree	Zone 6	<i>Osmanthus heterophyllus</i> , Holly olive	Zone 7
<i>Dirca palustris</i> , Wiewo, leatherwood	Zone 5	<i>Photinia villosa</i> , Oriental photinia	Zone 4
<i>Elaeagnus pungens</i> , Thorny elaeagnus	Zone 7	<i>Poncirus trifoliata</i> , Hardy orange	Zone 5-6
<i>Enkianthus campanulatus</i> , Redvein enkianthus	Zone 4	<i>Rhamnus frangula</i> 'Asplenifolia', Cutleaf alder buckthorn	Zone 2
<i>Euonymus bungeanus</i> , Midwinter euonymus	Zone 4	<i>Rhus chinensis</i> , Chinese sumac	Zone 5
<i>Euonymus europaea</i> , Spindle tree	Zone 3	<i>Rhus typhina</i> , Staghorn sumac	Zone 3
<i>Exochorda giraldii</i> var. <i>wilsonii</i> , Wilson pearlbrush	Zone 5	<i>Rosa</i> (selected hybrids and shrub roses)	
		<i>Stewartia ovata</i> , Showy stewartia	Zone 5
		<i>Symplocos paniculata</i> , Asiatic sweetleaf	Zone 5
		<i>Syringa meyeri</i> 'Palibin', Meyer's lilac	Zone 5
		<i>Syringa reticulata</i> , Japanese tree lilac	Zone 4
		<i>Viburnum lentago</i> , Nannyberry	Zone 2
		<i>Viburnum plicatum</i> var. <i>tomentosum</i> , Japanese snowball	Zone 5
		<i>Viburnum sieboldii</i> , Siebold viburnum	Zone 4
		<i>Viburnum prunifolium</i> , Blackhaw	Zone 3
		<i>Vitex agnus-castus</i> , Chaste tree	Zone 7



INDEX TO VOLUME 39, (1983)

Spring: LOW-MAINTENANCE GARDENING

Summer: ORIENTAL HERBS and VEGETABLES
Autumn: FLOWERING TREES

Symbols: Sp (Spring, No. 1); Su (Summer, No. 2); Au (Autumn, No. 3);
W (Winter, No. 4)

ABRAHAM, DOC and KATY, Sp 62
AMES, EVELYN, W 40

BARON, MILTON, Au 8
BEATTY, VIRGINIA L., Sp 59, Su 65-75
BERGMAN, ERNEST, Su 37
Bloom failure, W 33
Bonsai companion plants, W 52
Books, Reviews for 1983, W 58
BOWLES, J. PAUL, Sp 31
Brooklyn Botanic Garden, letters to, W 57
BRUMBACK, WILLIAM E., W 34
BUBEL, NANCY, W 46
BURCHFIELD, LARRY, Sp 11
BURGE, F. WELDON, Su 46

California, trees and shrubs for, Au 50
CHANDLER, PHILIP E., Au 50
CHAPMAN, DOUGLAS J., Au 26
Cherry trees, Au 15, 19, 46, 66; Higan, Au 17; Japanese, Au 15; Sargent, Au 17; Yoshino, Au 17

China, vegetable farming in, Su 37; fragrant rice from, W 48; North American plants in, W 37; traditional medicine of, Su 60

Chinese vegetables, culinary herbs, Su 15; fruits and seeds, Su 11; fungi, Su 18; growing Chinese cabbage, Su 43; leafy greens, Su 4; roots and stems, Su 7

COCHRAN, KENNETH D., Au 57
Construction in the garden, materials and techniques, bricks, Sp 11; stones, Sp 12; ties, Sp 13; timbers, Sp 13

COOK, ALAN D., Sp 1, 4, 9, 26, 66, 67; Su 1, 42, 43, 70; W 16
Crab-apples, Au 8, 21, 27, 32, 47, 49, 66, 69; culture, Au 9; how to choose, Au 13; information chart, Au 10; readings, Au 14

Crop rotation, W 46; to control disease, W 46; to control insects, W 46; to increase nutrients, W 46

Culture of plants in Space, W 44
Curry paste, Su 25

DAUGHTREY, MARGERY, W 13
DELANO, RICHARD H., Sp 23
DIRR, MICHAEL A., Sp 27
Dogwoods, dieback disease, W 13; flowering, Au 3, 21, 27, 32, 47, 49, 66, 69; lower branch dieback, Au 5

DUNNE, HENLEY, Su 4
EDITORS, *Gardens for All News*, Su 29
Environmental Research Lab, W 41
EPCOT, W 41

FELL, DEREK, Su 44
FEUCHT, JAMES R., Au 43
Fish sauce, Su 25
FLINT, HARRISON L., Au 22
FLOOK, MARNIE, Sp 35
Flowering shrubs, pruning into tree forms, Au 68

Flowering trees, branching structure, form, foliage, Au 65; cherries, Au 15; crabapples, Au 8; designing with, Au 61; dogwoods, Au 3; for northern landscapes, Au 26; for the desert southwest, Au 54; for the Pacific northwest, Au 46; for the Rocky Mountain region, Au 43; for the South, Au 37; for very Deep South, Au 39; in summer for central and northern climates, Au 31; lesser-known, Au 22; of California, Au 50; on streets and roadways, Au 18; planting and care of, Au 57

FORD, ROBERT E., Au 61
FRANKEL, BETTY, Sp 51
FUKUSHIMA, KIMIYOSHI, Su 50

GALLE, FRED, Au 37
Gardening, by the sea, W 8; indoor, W 55; new techniques, W 41; on slopes, Sp 19; on the vertical, Sp 44; with containers, Sp 42; with espaliers,

Sp 42; with flue tiles, Sp 46; with hanging baskets, Sp 42; with raised beds, Sp 42

GLEAVES, CHARLES T., Sp 56
GROUNDCOVERS, Sp 52

HAGAR, SILAS S., W 49
HAMADA, SUSUMU, Su 74
Hardiness Zone Map, Sp 72, Au 70
HARPER, PAMELA J., W 8
HATCH, PETER, W 3
Herb gardens of Japan, Su 54
Herbs, Chinese, Su 15; Japanese, Su 48, 51, 52, 53
HIBBEN, CRAIG R., W 13
HUNTER, DONNA, Sp 38

Indoor light-gardening, W 55; daylength, W 55; equipment, W 55; humidity, W 56; soil, W 55; water, W 55
Integrated Pest Management (IPM), Sp 70
Irrigation, Sp 16

JARANTOSKI, KRIS S., Sp 42
Jefferson, Thomas, as gardener, W 3
JENSEN, MERLE, W 41
JONES, GORDON, Au 3
JOYNER, MARGARET E.B., Sp 1, Su 1, Au 1, W 1

KATO, NOBUHIDE, Su 52
KIELBASO, J. JAMES, Au 18
KOLLER, GARY L., Au 68
KOPP, GLENN, Su 20
KVAALEN, RUTH, Au 31

LADENDORF, SANDRA F., W 55
Lawn tips, Sp 50
LEWIS, CLARENCE E., Au 15, 65

Magnolias, Au 5, 27, 34, 46, 48, 57, 69
MAKIHARA, NAOMI, Su 51, 69, 75
Materia Medica, Chinese, Su 62; Japanese, Su 58
Minimal Maintenance, annuals, Sp 38; by design, Sp 6; by landscaping, Sp 51; by planning,

Sp 9; by using native plants, Sp 4; lawns, Sp 48; perennials, Sp 31; rock gardens, Sp 35; trees & shrubs, Sp 27

MIZUSAWA, MITSU, Su 48

Morning Glories: A Poem, W 40

MOSOFE, SERLE IAN, Su 26

Mulches, Sp 62, 66

NEARY, JOHN, W 41

NIELSEN, DAVID G., Sp 70

OHYAMA, ISAMU, Su 68, 71, 72, 73, 74

Oriental herbs and vegetables, A Dictionary, Su 65; reading materials, Su 76; sources for, Su 76

Oriental melon, Su 46

PARTYKA, ROBERT E., Sp 16

PESCH, BARBARA B., Au 1, 3, W1, 3

Pesticide pointers (application), Sp 72

Prairie plants and gardening, Sp 56

PREACHER, JAMES, Su 39

Raised-bed culture, Su 28; harvesting, Su 36; planting, Su 32; watering, Su 35

RAMSEY, DEAN, Sp 11

Rock gardening, Sp 35

ROHDE, MARGARET, W 52

Roses, growing Old Roses, W 29; Old Roses, W 28; Sources for Old Garden Roses, W 32

SCHERY, ROBERT W., Sp 48

SHAUDYS, PHYLLIS, Su 44

SHEEHAN, TOM, Au 39

SHER, WILLIAM, Su 74

“Shichimi” spices, Su 50

SHIMADA, HARUYA, Su 54

Shrubs, for seaside planting, W 10; tree-trained, Au 68

SIEBENTHALER, JACK, Sp 6

Soil, drainage, Sp 16; heavy metals in, W 47

“Space Plant Culture,” W 44

STEEFEK, EDWIN F., Sp 69

Stir-frying, Su 26

SUZUKA, OSAMU, Su 53, 66, 69, 70, 73, 75

TALBERT, PATRICIA, Sp 46

Terracing, Sp 22

Thai vegetables, Su 20

TIM, NANCY, Su 4

TIM, STEPHEN K-M., Su 4

Tools in the garden, Sp 69

TOTEMEIER, CARL A., W 33

Trees, auto pollutants and, W 51; flowering, “Flowering Trees” Autumn Issue; for seaside, W 10; killing of, W 16; minimal maintenance of, Sp 27; how to plant, W 16; reading leaves of, W 20; street trees, Au 19, 21; stress, environmental, W 24

TRIMBLE, MICHAEL B., W 20

Tubaponics, W 49

Vegetable spaghetti, Su 44

Vegetables, Chinese, Su 4, Su 43; cross-row raised-bed, culture of, Su 29; fuss-free, Sp 23, Sp 26; rotating crops of, W 46; Thai, Su 20

Water-chestnuts, Su 39

Weeds, Sp 67

WEINSTEIN, GAYLE, Sp 52

WEISMAN, BRENDA, W 57

WESTCOTT, DR. CYNTHIA, *in memoriam*, W 61

WHITSEL, GILBERT L., Sp. 19

WIDMOYER, FRED, Au 54

Wild flowers, W 34, Sp 59

Winged bean (*Psophocarpus tetragonolobus*), Su 42

WITT, J.A., Au 46

WORCESTER, WAYNE, W 28

Wok cooking, Su 26

XIZHI, LOU, W 48

YAOPING, XU, W 37

YASHIRODA, KAN, Su 65-75

YOUNG, CHAO, Su 60, 62



The Shakespeare Garden

A man does not plant a tree for himself, he plants it for posterity.
Alexander Smith

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- 13 DWARFED POTTED TREES: THE BONSAI OF JAPAN
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- 102 FLOWERING TREES
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- 98 HANDBOOK ON CULINARY HERBS
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- 69 THE HOME VEGETABLE GARDEN
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- 72 NATURAL PLANT DYEING
- 58 MINIATURE GARDENS (*sink and trough gardens*)
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- 70 HOUSE PLANT PRIMER
- 90 HOUSE PLANTS
- 93 GARDENING UNDER LIGHTS
- 42 GREENHOUSE HANDBOOK FOR THE AMATEUR
- 53 AFRICAN-VIOLETS AND THEIR RELATIVES
- 81 BONSAI FOR INDOORS
- 54 ORCHIDS
- 43 SUCCULENTS

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- 75 BREEDING PLANTS FOR HOME AND GARDEN
- 49 CREATIVE IDEAS IN GARDEN DESIGN
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PLANTS & GARDENS

THE CROTON GARDEN RECORD

THE YEAR

1883-84

RECORDED

BY

ALICE C. JENSON

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PLANTS & GARDENS

BROOKLYN BOTANIC GARDEN RECORD

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CONTENTS

<i>Another Spring Commences</i>	<i>USDA/William A. Carnahan</i>	Cover
Among Our Contributors		Inside Front Cover
Letter from the Brooklyn Botanic Garden		2
Thomas Jefferson as Gardener	<i>Flower and Garden</i>	3
Seaside Gardening	<i>American Horticulturist</i>	8
Dogwoods: Will They Survive?	<i>The New York Times</i>	13
How to Kill a Tree	<i>Flower and Garden</i>	16
Reading Tree Leaves	<i>American Horticulturist</i>	20
Members' Seed Dividend		27
In Love with Cellar Hole Roses	<i>Yankee Magazine</i>	28
Why Plants Fail to Bloom	<i>Old Westbury Garden News</i>	33
Wild Flowers to Grow from Seeds or Cuttings	<i>The New York Times</i>	34
North American Plant Immigrants	<i>China Reconstructs</i>	37
Morning Glories, a Poem	<i>The Vineyard Gazette</i>	40
Brave New Garden	<i>Horticulture</i>	41
Rotate Vegetable Crops for Higher Yield	<i>Country Journal</i>	46
Heavy Metals in City Soils	<i>Environmental Pollution</i>	47
Chinese Fragrant Rice	<i>China Reconstructs</i>	48
Try Tubaponics for Small Spaces	Silas Hagar	49
Trees Capture Auto Pollutants	<i>Crops and Soils</i>	51
Bonsai Companion Plants	<i>Bonsai Journal</i>	52
Getting Wild Strawberries Home		54
Light Up an Indoor Garden for Year-Round Enjoyment	<i>The Christian Science Monitor</i>	55
At BBG: We Get Letters—and How!	Brenda Weisman	57
Recent Books Worth Noting		58
In Memoriam—Dr. Cynthia Westcott		61

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LETTER FROM THE
BROOKLYN BOTANIC GARDEN

Following the tradition established four decades ago, the year-end issue of *PLANTS & GARDENS* again includes many fine horticultural articles that were gleaned throughout the year. We thank the authors and the several publications for permission to reprint these for the edification of BBG members who might otherwise have missed them.

Assembling the wide-ranging articles has been the responsibility of the Garden's new Director of Publications, Barbara Pesch. We welcome Mrs. Pesch who has come to the Garden with considerable experience—at Sunset Books, then with The Chicago Horticultural Society Botanic Garden and later the Missouri Botanical Garden. She replaces Frederick McGourty who was editor of *PLANTS & GARDENS* for fourteen years. We wish Mr. McGourty well in his new endeavors.

In addition to finding articles for inclusion in this issue, Barbara Pesch has reviewed the many new botanical and horticultural books that came to the Garden's library during the year. The reprinting of books by English authors for the American horticultural market has culminated in a complete reissue of the works of Gertrude Jekyll, that influential garden designer of turn-of-the-century Britain.

To predict gardening trends from our observations at BBG: there will be a continuation of the perennials boom, an increased interest in old and species roses, and a revival of two very diverse types of horticulture—Japanese and wild flower gardens. Both of these are well represented at BBG. The Japanese Hill-and-Pond Garden was constructed seventy years ago, and the local Flora Section in 1911. Both are popular areas within these busy 50 acres, and we would like to extend an invitation to all members who have not seen them to enjoy a visit in 1984.

May it be a good gardening year for you.

Sincerely,

Elizabeth Scholz



The West Front

Archaeology teamed with his extensive records reveal...

THOMAS JEFFERSON AS GARDENER

Peter Hatch

Reprinted with permission from *Flower and Garden Magazine*, June/July, 1983.

When Thomas Jefferson referred to his "garden" during the fifty years he regarded Monticello as his home, he, like most early Americans, was speaking of his vegetable or kitchen garden, which with his orchard and vineyards composed eight acres on the sunny southern slopes of his "little mountain."

Probably no other early American gar-

dener kept as extensive a notebook on his garden as Jefferson, and the daily activities of sowing seeds, manuring asparagus, and harvesting peas between 1809 and 1826 as precisely recorded in his "Garden Kalender," which, with his *Garden Book* as well as most of the letters he wrote or received having to do with horticulture, was published by the American Philosophical So-

ciety in 1944. (Ed. note: It is still in print and very reasonably priced.)

The *Garden Book* is an extraordinary work detailing Jefferson's fascination with the natural world, including dreamy visions of romantic grottoes as well as concise notes on the culture of as many as 250 vegetable and 150 fruit varieties. He said that the "greatest service which can be rendered any country is to add an useful plant to its culture," and his experimental efforts at raising such a broad spectrum of useful and ornamental plants established Monticello as a botanic garden, an experimental station of new and unusual introductions.

An Ambitious Dream

The garden and orchard at Monticello are remarkable for a number of reasons, the most striking of which is the scale and scope of the area. The 1,000-foot-long vegetable garden terrace was literally hewed from the mountainside, so that one nineteenth-century visitor would describe it as a "hanging garden."

This garden plateau was supported by a massive stone wall that at one point stood nearly twelve feet high. Perched atop the wall was a brick pavilion, 12½ feet square with a Chinese railing around a pyramidal roof, situated so precariously that it was blown down in a violent storm in 1824.

Ranging below the wall were the 400-tree orchard, terraced vineyards, and "berry squares" for Jefferson's favorite raspberries, gooseberries, and currants. Surrounding the entire complex was a ten-foot-high solid board or paling fence, 4,000 feet long with boards "so near as not to let even a young hare in," according to Jefferson.

Such a dominating visual landscape can be recreated quite precisely due to the wealth of documentation in the *Garden Book*. The Thomas Jefferson Memorial Foundation, which owns and operates Monticello, is committed to an ongoing restoration of this area. The commitment began in 1979 with two years of archaeological excavations that complemented the documentation, confirmed garden details, and enabled the restoration to begin.

Archaeologists uncovered the remnants of the stone wall, robbed in the twentieth century, and covered by eroding soil. They traced the fence line by uncovering post

hole stains, and searched for the nature of garden walkways. Tree hole stains from nearly seventy of the original orchard trees were also uncovered, revealing a planting pattern identical to one drawn by Jefferson in 1778.

An 18th Century Experiment Station

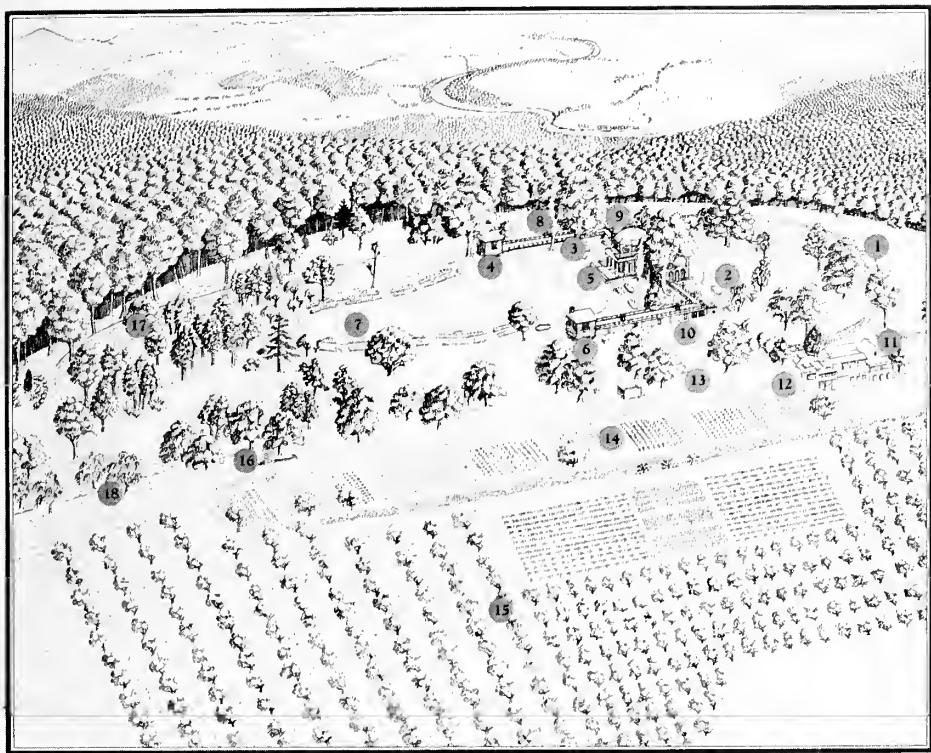
The experimental nature of the garden and orchard is especially noteworthy. Not only did Jefferson import the finest French pears, English cherries, and Dutch cabbages, but he also cultivated beans, corn, and gooseberries brought from the West by Lewis and Clark as well as apple and peach varieties newly discovered in the New World. This proliferation of varieties enabled Jefferson to selectively eliminate inferior types, as revealed in a letter of 1810: "I am curious to select only one or two of the best species or variety of every garden vegetable, and to reject all others from the garden to avoid the dangers of mixing or degeneracy."

The dominating feature of the garden itself is its general prospect and situation, facing southeast and carved from the hillside, so that it is ideal for capturing the winter sun and extending the season as well, being elevated enough to avoid spring and fall frosts.

The garden season often began in February and, with some vegetables, extended through the winter months. Jefferson organized the garden with a border against the northern bank, the Northwest Border, and so had a clear advantage in the neighborhood pea contests. Whoever brought the first peas to table in the spring would host a community dinner, which of course included the winning English peas.

The garden was divided into twenty-four squares, and the squares, at least in 1812, were arranged according to which part of the plant was being harvested, whether "fruits" (tomatoes, beans), "roots" (onions, beets), or "leaves" (lettuce, cabbage). Although it is doubtful Jefferson felt this companionable plan would result in tastier and more productive vegetables, and in fact modern research would probably prove a diverse planting more efficient, it seems an aesthetically pleasing means of organizing a garden.

Aside from the experimental as well as



Jefferson's Monticello today. 1. Shuttle Arrival and Departure; 2. East Front; 3. North Terrace Walk; 4. North Pavilion; 5. West Front and Oval Flower Beds; 6. South Pavilion; 7. Roundabout Walk and Flower Border; 8. North Dependencies (i.e. Stables, Ice House, Carriage House, Washhouse); 9. All Weather Passageway; 10. South Dependencies (i.e. Servants' Rooms, Smoke House, Kitchen); 11. Gift Shop; 12. Weaver's Cottage, now used as offices; 13. Mulberry Row; 14. Vegetable, or Kitchen Garden; 15. Orchard, Vineyard, Berry Squares (Being restored); 16. Joinery; 17. Grove; 18. Walk to Graveyard, Shuttle Station, and Lower Parking Area.

the obvious culinary function of the garden, Jefferson considered the ornamental features such as the garden pavilion, so dramatically situated on the edge of the wall. Occasionally he would be overcome with delightful fancies for his garden and would plant an arbor of different flowering shades of the scarlet runner bean (*Phaseolus coccineus*), arrange adjacent rows of purple, white, and green sprouting broccoli, or even white and purple eggplant, and border his tomato "square" with okra, a rather unusual juxtaposition. In 1811 he bordered his nursery area with castor beans (*Ricinus communis*), perhaps using the planting as an animal deterrent but certainly aware of the plant's ornamental qualities.

A major influence on Jefferson's garden-

ing practices as well as the types and varieties of vegetables he cultivated was Bernard McMahon, a Philadelphia nurseryman and author of *The American Gardener's Kalendar*, the best American work on practical gardening in the first half of the nineteenth century. But Jefferson was very concise in summarizing his basic gardening sensibility when he wrote to his daughter, Martha Randolph, in 1809: "We will try this winter to cover our garden with a heavy coating of manure. When earth is rich it bids defiance to droughts, yields in abundance, and of the best quality. I suspect that the insects which have harassed you have been encouraged by the feebleness of your plants; and that has been produced by the lean state of the soil."



A partial view of Thomas Jefferson's vegetable garden plateau located on the southeastern slope. To the left will be the restored orchard.

The discussion of fertilizing techniques in the early garden literature revolved around the use of different composts and manures, and the horticultural sophistication of the gardener could be nearly gauged by the amount and quality of his composts.

Jefferson's directions to his overseer, Edmund Bacon, in 1809, perhaps reflect his reading of McMahon, whose directions for the application of manure were very specific. Jefferson wrote: "6 waggon loads are first to be laid on the old asparagus bed below the wall, which Wormley [the gardener] must immediately spread even & then fork it in with the three pronged garden fork, taking care not to fork so deep as to reach the crown of the Asparagus roots. Then begin at the S. W. end of the garden, and drop a good waggon load of dung every five yards along a strait line through the middle of the garden from the S. W. to the N. E. end. This will take between 60. & 70. loads in the whole, which will do for the first year."

Perennial vegetables such as strawberries and asparagus commonly received a mulch of manure and even tobacco suckers, and Jefferson often referred to the construction of manure-based "hills" for the planting of

melons, squashes, cucumbers, and even pole beans.

It was essential, and Jefferson was especially sensitive to this being primarily a vegetarian, that the season extend longer, or else that the vegetables be stored effectively through the winter. Pea and bean varieties were chosen for their storage capabilities, and cucumbers and others were grown chiefly for their pickling qualities. Many of the vegetables grown by Jefferson were varieties grown for centuries in Europe, and according to some authors, differed little from the varieties grown by the Romans. The nature of these vegetables has since altered owing to the technology of modern commercial production, the cultural tastes of the public, and even the function of the vegetable itself. Dwarf plants, even harvesting dates, a fruit suitable for shipping, larger fruits, and insect and disease resistance are examples of some of the variations that distinguish modern varieties from their nineteenth century parents.

Jefferson particularly fancied salad greens, dressed or raw, and his extensive list reveals the necessity of winter-growing greens such as lettuce, spinach, corn salad, pepper grass, orach, endive, sorrel, mus-

"I have often thought that if heaven had given me choice of my position and calling, it should have been on a rich spot of earth, well watered, and near a good market for the productions of the garden. No occupation is so delightful to me as the culture of the earth, and no culture comparable to the garden. Such a variety of subjects, some one always coming to perfection, the failure of one thing repaired by the success of another, and instead of one harvest a continued one through the year. Under a total want of demand except for our family table, I am still devoted to the garden. But though an old man, I am but a young gardener."

Jefferson to Charles Willson Peale, 1811

tard, turnips, and kale. He planted sesame (*Sesamum orientale*) yearly hoping to find a suitable oil for his salads. The culture of cabbages, cauliflower, broccoli, kohlrabi, Brussels sprouts, and root crops like beets, carrots, radishes, onions, shallots, garlic, leeks, salsify, and Jerusalem artichokes further extended the calendar for fresh vegetables, especially when grown in cold frames or hotbeds, a common nineteenth century practice.

Sea kale (*Crambe maritima*), a member of the cabbage family native to England, was a favorite of Jefferson's for the tender blanched sprouts which appear in the late winter. Another favorite vegetable was the French artichoke, for which he kept yearly records of its harvest dates. One should also note the oddities of the vegetable world such as many-headed cabbage and a serpentine cucumber that were further examples of Jefferson's experimental garden.

The Extensive Orchard

The 400-tree orchard, like the vegetable garden, consisted of a broad spectrum of 125 varieties of ten different types of fruit trees, from apples to apricots. Grown for what Jefferson called the "precious refreshment" of their fruit, trees were imported from Europe, propagated from neighbors, and purchased from nurseries such as the William Prince Nursery of Long Island.

The peach was probably his favorite fruit, and he grew thirty-seven varieties including old American types like the Heath cling and the Oldmixon free as well as varieties from Italy such as the Teton de Venere. The two most prominent apples were the Albemarle (Newton) pippin and

the Esopus Spitzenberg, both revered by old-time apple enthusiasts.

Jefferson said the Seckle pear, which is still common in supermarkets, "exceeded anything I have tasted since I left France, & equalled any pear I had seen there." The Carnation was his favorite cherry variety, "so superior to all others that no other deserves the name of cherry." Although some varieties have apparently disappeared from cultivation, such as the Taliaferro ("... the most juicy apple I have ever known..."), many types have been located and replanted in the precise locations designated by Jefferson and discovered by modern-day archaeologists.

Original Garden Restored

U.P. Hedrick, in *The History of Horticulture in America to 1860*, said that "every southerner knew of the agricultural and horticultural practices at Mount Vernon and Monticello, and followed as far as possible ... operations at these two estates." Surely Hedrick is exaggerating, but in the wide range of types and varieties of fruits and vegetables, and in the progressive nature of Jefferson's horticultural practices, the orchard and garden at Monticello did represent the state of the art of fruit and vegetable culture in the early 1800's. Presently, the garden has been restored, the orchard mostly planted, the garden pavilion is under construction, and the "great wall" nearly completed. The restoration of the vineyards and paling fence is projected for the near future. ♫

Thomas Jefferson's Monticello is open to the public every day except Christmas, through summer months from 8 a.m. to 5 p.m. It is located at Charlottesville, Va.



Selection, protection—two keys to . . .

SEASIDE GARDENING

Pamela Harper

Reprinted with permission from *American Horticulturist*, August, 1983.

Seaside gardens are a mixed blessing. Summers are cooler than they are inland; winters are warmer; spring and autumn frosts are farther apart; summer breezes lower humidity, making the garden a pleasanter place to be and lessening the likelihood of the insect and fungus infestations that occur when the air is stagnant. Gusting, salt-laden gales are the other side of the coin, blackening and defoliating plants, and sometimes tearing them out of the ground.

The soil is usually sandy. Sand warms up early in the year, so seashore gardeners have a head start over those inland, which is particularly advantageous in the vegetable garden. Sand is easy to dig, and it can be worked or walked on after rain without damaging its structure. Sand absorbs water

rapidly, with little lost to runoff. On the other hand, sand dries out fast, it is usually low in nutrients, dry sand may drift, and although fast-draining, sand can get waterlogged if underlain by the tight-packed layer of subsoil called hardpan.

Shelterbelts for Wind and Salt Protection

Favored trees and shrubs for shelterbelts include pines, spruce, oaks, white poplar (*Populus alba*), autumn olive (*Elaeagnus umbellata*), arrowwood (*Viburnum dentatum*), wild thorns, bayberry (*Myrica* species), various privets, inkberry (*Ilex glabra*) and, in the mildest regions, such evergreens as *Escallonia* and *Griselinia*. Massed planting of a single species is unwise because if

(as with the elm) a pest or disease destroys that species, then all is lost; with a mixed planting you don't have all your eggs in one basket. Be guided by local knowledge: Japanese black pine (*Pinus thunbergiana*, formerly *P. thunbergii*) is one of the hardiest and most salt- and wind-resistant evergreens, but in some areas it is being decimated by nematodes. Whatever is chosen, plant them close for mutual protection, being prepared to do some thinning later if necessary.

If the garden is too small for a shelter-belt, then a wall, fence, hedge or the banked sand of dunes must provide protection. A solid wall may not be the best choice. When wind hits an impenetrable barrier it does not stop but goes over the top, or through such gaps as gateways, continuing with undiminished force and often wreaking more havoc than if no barrier had been there at all. Filtered wind goes on its way more gently, and tests have shown that 55 percent density is ideal. A wall of pierced concrete block or openwork brick is usually better than a solid one. A hedge might be the best choice were it not for the labor of keeping it trimmed.

Gardening in Sand and Raised Beds

With some of the bite taken out of the wind, there remains the sand. If it needs stabilizing, some of the best plants for the purpose include sea buckthorn (*Hippophae rhamnoides*), sea oats (*Uniola paniculata*), *Rosa rugosa*, and such native roses as *R. carolina* and *R. virginiana*. Temporary barriers (snow fence might be used) will be needed until the plants become well anchored.

When hardpan or clay underlies the sand, as it does in my own garden, spot treatment consists of boring holes with an auger and filling these with stones and gravel. A commoner solution is raised beds, often edged with railroad ties, or with planks of salt-treated, rot- and termite-resistant lumber. Because it can be bent to a curve, my own preference is for one-by-six-inch redwood strips, obtainable from lumberyards in lengths up to 16 feet. A tip: if the edging strip is insufficiently curved for your purpose when bent as far as it seems to want to go, knock in a stake (a garden fork does the job if you have one temporarily to spare) to hold it in that position, then leave it for a

few weeks. The redwood strip can then, with ease, be bent further. Raised beds need extra soil to fill them. Where I live topsoil is scarce, expensive and of poor quality, but wood mulch and sawdust are available. Paths alongside the beds were made by digging out a foot or more of soil (using this for the raised beds), putting a thick layer of overlapping newspapers (no color sections) at the bottom of the trench, then filling it with sawdust topped with mulch.

Raised beds dry out fast and mulching is advisable. Through a rainless summer my most drought-resistant plants were *Abelia x grandiflora* and *A. 'Edward Goucher'* (Zone 6 hardy), Indian-hawthorn (*Raphiolepis*) and Jerusalem-sage (*Phlomis fruticosa*), both hardy to Zones 7-8, rosemary (Zone 7), *Yucca filamentosa* (Zone 5), prostrate junipers (*Juniperus horizontalis*), (Zone 2), the Zone 4-hardy butterfly weed, gaillardia, daylilies, *Opuntia humifusa*, moss-pink (*Phlox subulata*) and the even-hardier creeping, ground-covering *Potentilla tridentata*, which I have found to be the very best carpeter for sun and sand. Magnolias, to my surprise, fared well. Dogwoods suffered most. Geraniums (*Pelargonium* spp.) are among the best container plants for seaside gardens.

There are two approaches to gardening on sand. The sand can be turned into loam by adding (and forever continuing to add) quantities of such humus-forming material as peat moss, compost, leafmold, manure and (nature's bounty for those who garden by the sea) seaweed. The other course is to grow plants that like, or at least put up with, sand. How can you tell which these are? Under seashore conditions it doesn't do to take something home from the garden center just because it's pretty. Most of the best seashore plants have leaves that are either slender or needlelike, gray, tough and leathery, or thick and fleshy, usually a combination of two or more of these qualities. These are all ways in which plants reduce transpiration and thus protect themselves against the desiccating effect of cold, wind, heat and salt.

Another clue lies in the family to which a plant belongs. Brooms (*Cytisus*, *Genista*, *Spartium junceum*), indigos (*Indigofera*), lead plant (*Amorpha canescens*), bladder senna (*Colutea*) and pea-tree (*Caragana*) all

belong to the Leguminosae or Pea Family. A characteristic of this family is the presence on the roots of little nodules caused by nitrogen-fixing bacteria.

Garden encyclopedias list plants recommended for seashore gardens. *Wyman's Garden Encyclopedia* is a helpful guide for East Coast gardeners, *Sunset's Western Garden Book* for the West Coast. The names of plants offer further clues. Anything with the botanical name *maritima* ("of the sea") is a likely candidate. Popular names to check out are those containing the words beach, coast, sea, shore, sand and salt. The plants listed below are among the best.

Trees and Shrubs

Sea buckthorn (*Hippophae rhamnoides*). Zone 4 (Arnold Arboretum Zone Map). Inland this grows tall, but on beaches it makes sand-stabilizing thickets of dense, suckering stems. The deciduous leaves are slender and gray. Rated A-1 for ruggedness, its most ornamental feature is the orange berries that wreath the thorny branches of female bushes. Sea buckthorn is dioecious (male and female flowers on separate bushes), so plant males in the ratio of 1-10, remembering that the pollen is windborne so the

male should be to windward of the females. Don't cut the berry sprays for indoor decoration; they stain, and they smell nasty. Birds leave them alone, so it seems they taste nasty too, but they look very pretty.

Rugose rose or Sea tomato (*Rosa rugosa*). Zone 2. The second name comes from the hips, which resemble cherry tomatoes. These clash with the large, fragrant, magenta-pink flowers borne from late spring until frost, so the white form might be preferred; this comes true from seed. Bristly, stoloniferous stems sometimes attain six feet, but at the beach seldom more than three feet. A stalwart shrub, *R. rugosa* is good for dune planting, undaunted by cold, wind, salt-spray, drought and the meager sustenance offered by sand. There are several lovely hybrids, somewhat less tough.

Beach plum (*Prunus maritima*) and **Sand Cherry** (*Prunus besseyi*), Zone 4. These similar shrubs (the first for the East Coast, the second for the West) grow wider than high, seldom much more than four feet, on wind-swept seashore sites. Massed white blossoms in spring are followed by black fruits used for pies, jams and jellies.

Shore juniper (*Juniperus conferta*). Zone 6. That junipers are adaptable is evident



A native prickly-pear hardy as far north as Massachusetts, *Opuntia humifusa* has 3 1/2" lemon yellow blooms.



Shown only slightly larger than life size. *Rosa rugosa* hips persist into late autumn and beyond. This rose is very salt and wind tolerant.

from the ubiquity of the so-called red cedar, *Juniperus virginiana*, at home in so many states and sites including seaside gardens, averse only to boggy soil and shade. Greenneedled, prickly shore juniper, found wild on Japanese beaches, is one of the best carpeting junipers for sun and sand where it is hardy enough. The cultivar 'Blue Pacific' has blue-green needles.

Shore pine or beach pine (*Pinus contorta*). Zone 7. This species grows along the coast from California to Alaska, usually dwarfed and contorted, though in a sheltered site it is irregularly pyramidal. It is useful for fixing dunes. Many other pines do well by the sea, but not the much-loved white pine (*Pinus strobus*), which scorches. On California's rocky headlands the Monterey pine (*P. radiata*, Zone 7) forms picturesque, and sometimes grotesque, wind-shaped bonsai. In colder areas Japanese black pine (*P. thunbergiana*, Zone 5) can be seen on the dunes just above high water mark. Swiss mountain pine (*P. mugo*, Zone 2) is usually comparatively low and bushy, hunkered down out of the wind, but seed-grown plants are a pig-in-a-poke because this is a variable species; they might grow three feet high, or thirty.

Sea myrtle (*Baccharis halimifolia*). Zone 5. This plant will grow in quite dry soil but prefers salt marshes. It is usually about four to six feet tall with gray-green leaves. The flowers pass unnoticed, but in autumn cottony seed plumes turn the bushes to low-anchored clouds hovering over the marshes.

Salt cedar (*Tamarix* spp.). There are several species, all a good choice for seaside gardens. *T. ramosissima*, formerly *T. pendandra*, is the hardiest—Zone 2 according to *Wyman's Gardening Encyclopedia*. Tamarisks in bloom look as insubstantial as pink cotton candy; this is their strength, for they yield to the wind, then sway back upright. Tamarisks get leggy if not pruned, and when you do it is important. Prune spring-flowering kinds within a month after flowering. Prune late-flowering kinds (*T. ramosissima* is one) just before growth begins in spring.

Perennials and Grasses

Sea oats (*Uniola paniculata*). The oatlike fruits on the three- to five-foot flexible stalks of this Southeastern grass can be seen tossing over the dunes of the Outer Banks, spreading by rhizomatous roots that hold the sand in place. Sea oats can be grown



For milder-climate dune stabilization, sea oats (*Uniola paniculata*) are an elegant solution.

from seed. It is not hardy at below zero temperatures. *Chasmanthium latifolium*, formerly *Uniola latifolia*, is often called Northern sea oats but with little justification, its natural habitat being rich woodlands. It is an attractive grass, Zone 4 hardy, but not well adapted to seaside gardens unless in enriched soil with some shade and protection from salt-laden wind.

Sea fig (*Carpobrotus chilensis*). This is a tender, trailing plant with succulent leaves and brightly colored, daisy-type flowers. It is excellent beach cover in frost-free areas.

Sea holly (*Eryngium* spp.). Sea hollies have grayish, spiny leaves and grayish or bluish stems; the flowers are thistlelike. One-foot *E. maritimum* grows wild on English beaches. More often offered in America are *E. planum*, about three feet tall with light-blue flower heads and blue-green bracts, and the one-foot cultivar 'Blue Dwarf', hardy to Zone 6. In common with many drought-resistant plants, sea hollies have long, thonglike roots and may not survive transplanting once established. They can be propagated by root cuttings.

Sea lavender (*Limonium latifolium*). Annual limoniums are the statice of dried bouquets. This species is a very hardy perennial, about two feet high when in flower. The massed, hazy flowers, resembling a mauve gypsophila, spring from basal clumps of cabbagelike leaves that are evergreen except in the coldest areas. It is hardy to Zone 4, likes sand, prefers it moist and will even grow in salty swamps. In frost-free gardens *L. perezii* is often preferred.

Beach wormwood (*Artemisia stellerana*). Zone 4. Gray-foliaged plants all need well-drained soil, and for most of them it should not be rich. Unfortunately, many are tender, and some rot in wet or humid summers. Beach wormwood is a survivor on both counts, unsurpassed as a winter-hardy seashore sub-shrub, which means that it wants to be woody-stemmed and evergreen but manages this only in mild areas, elsewhere disappearing from sight in winter. The white-woolly leaves are shaped like those of chrysanthemums. On the beach the stems tumble over and hug the ground, rooting as they go. It will grow in pure sand, even on the seaward side of the dunes. The flowers, drab creamy spikes, are no asset.

Artemisia ludoviciana, a highly variable species, one form of which is known as 'Silver King', is another possibility for an untamed setting. The gray, willowy leaves are dainty, but the running roots are too invasive for the flower border.

Sea pink (*Armeria maritima*) Zone 4, and seaside daisy or beach aster (*Erigeron glaucus*, Zone 4) can be found cliff-hanging within sound and splash of the sea on English and California coasts respectively. Sea pink makes grassy tufts of leaves topped by numerous pink or white drumstick flowers. Beach aster grows less than one foot high, with rosettes of oval leaves and yellow-disked, mauve-rayed daisies. Both do well in well-drained, sandy soil. When sea pink gets patchy it needs lifting and dividing.

Having chosen your plants, there may be a problem getting them established in the sandy soils so much enjoyed by moles and mice. Plants tunneled under will die if their roots are left suspended in air. Wrapping the rootballs of small plants in chicken wire helps prevent disturbance while they are getting established. ☘

DOGWOODS: WILL THEY SURVIVE?

Margery Daughtrey and Craig Hibben

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One of the most splendid sights in spring is the fleecy white flowering dogwood. But in the Northeast these trees show unmistakable symptoms of decline.

Some experts explained this dogwood decline as a sign of old age, speculating that a dogwood is not meant to perform for longer than about twenty-five years. But trees one inch in diameter and smaller are failing just as fast as their elders.

Others have blamed the rigors of a front-lawn environment, saying that a tree which grows naturally in a shaded forest is not going to perform well when grown in full sunlight. But dogwoods in woodland settings are declining just as surely as those grown on open lawns.

The problems affecting dogwoods seem to have no favorites: they affect the old, the young, the exposed, the shaded. Reports of ailing dogwoods have come in from Connecticut, New Jersey, Pennsylvania and southeastern New York State, especially from Westchester, Nassau and Suffolk counties. The declining dogwoods in this wide geographic area are showing many of the same symptoms.

Symptoms of Disease

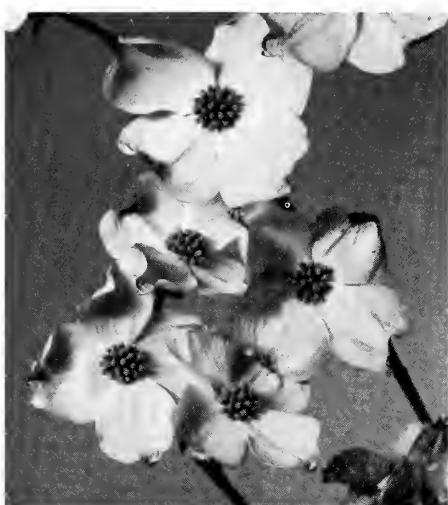
The earliest sign of disease is a spotting and blighting of the foliage. Brown blotches and small, purple-rimmed spots appear on the leaves, particularly those in the lower part of the canopy. Small twigs on the lower branches begin to die, turning tan and dry at the tips. After a year or more of leaf and twig death, watersprouts appear on the trunk and main branches of the affected trees. This watersprouting is a physiological response to the "pruning" of tips by dieback. Unfortunately, infection progresses beyond this stage. As the watersprouts become infected and die, cankers (localized patches of dead bark) develop at the base of sprouts. Significant damage follows. Entire

branches, typically the lowest ones on a tree, are killed. This may occur during the growing season, but the injury is often not noticed until spring when lower branches fail to bloom or leaf out.

Dieback gradually advances into the upper canopy. In a few years, the tree may be killed. The disease has been named "dogwood lower-branch dieback" to describe the progression of symptoms upwards.

Numerous fungi attack dogwoods, but one fungus in particular has been associated with lower branch dieback. The fungus, a species of *Discula*, has been identified from pimplelike reproductive structures on dead twigs and from laboratory cultures obtained from infected leaves and twigs. The *Discula* fungus appears to be contributing significantly to the decline of dogwoods, but conclusive proof requires further research.

Dogwood lower-branch dieback belongs to a general group of tree diseases known



George T. Lofquist

The beauty of the native dogwood's spring blooms fully justify the concern for its survival.



Photos by Margery Daubney

into soil, they should be one of the first trees to show the ill effects of drought.

Researchers have found that water stress conditions brought on by drought can predispose woody plants to serious canker-type diseases. There is reason to suspect that the fungus now seriously affecting dogwood has been present all along. Changes in environment probably lessened the vigor of the dogwood and the *Discula* fungus has been unusually successful in attacking it.

Dogwoods have recently been subjected to other stresses besides drought. The mid-1970s were marked by abnormally cold winter temperatures, a circumstance which might affect trees growing at the northern extremity of their natural range. Fluctuating temperatures during the winter may also have a pronounced effect on tree health, particularly when there is an abrupt dip from a warm temperature to below freezing.

The spread and successful invasion of a leaf-infecting fungus like *Discula* may have also been fostered by unusually wet springs. Any one of a combination of these factors could pre-dispose dogwoods to the disease.

To control anthracnose diseases, fungicide sprays are applied in spring. The goal is to maintain a protectant coat of chemical on expanding leaf surfaces. To achieve this, fungicide must be applied repeatedly until leaves are full size. In some cases, additional sprays are helpful during rainy periods.

Fungus Control

Since a dogwood's lower-branch dieback behaves much like other anthracnose disease, control measures can be based on these similar diseases. Obviously, not every

Why the Sudden Onset?

One of the big questions regarding dogwood lower branch dieback is why it has suddenly appeared to plague this landscape favorite. Dogwoods are native to the northeastern United States and they have long been cultivated as ornamentals. Yet there is no record of a widespread problem of epidemic proportions such as this. A clue to understanding the sudden appearance of this dogwood disease may be a recognition of the environmental stresses this tree has been exposed to recently.

Dogwoods are shallow-rooted, favoring cool, moist sites such as banks of streams. Since their roots do not penetrate deeply



Speckled twig cankers and withered infected leaf.



The leafless lower branches show that the fungus has spread to much of the tree's surface.

dogwood in the Northeast can receive fungicide sprays to discourage anthracnose. Homeowners, arboreta and parks have the option of taking steps to save their most valuable ornamentals.

Dogwoods should be given three to four sprays, starting at leaf-bud break. The fungicide must be reapplied at seven-to-ten-day intervals until leaves are fully expanded. Until spray trials have been conducted on this particular disease, it will be impossible to identify a treatment of choice. Fungicides expected to be effective include zineb, benomyl, maneb or mancozeb. Follow label directions.

The severity of anthracnose diseases varies with the wetness of the spring: a great deal of rain during leaf enlargement increases the potential for leaf infections and a shorter spray interval may be necessary for good control. It is best to concentrate efforts on those trees in early stages of decline, rather than trying to bring dogwoods with extreme symptoms of dieback back to life.

Good Sanitation and Cultivation

When feasible, fallen leaves should be gathered in the autumn as they are one source of fungus spores. Dead dogwood leaves often

cling to the tree through the winter, particularly on recently-killed branches. These leaves should be removed as well.

Dead twig tips, branches and watersprouts—all sources of fungus spores—should also be pruned from the tree. Pruning should never be attempted when leaves and twigs are wet.

Steps to promote tree health should accompany efforts to combat the fungus. During the growing season, provide an inch of water in any week there is insufficient natural rainfall. Dogwoods should also be kept moist in fall so that they do not go into the dormant season in a water-stressed condition.

Moderate applications of fertilizer may also help to restore vigor. Apply fertilizer in the dormant season or in early spring; never stimulate growth with fertilizer applications after mid-July or trees may not have time to harden off properly.

A cooperative research program by Cornell University, the Brooklyn Botanic Garden Research Center and the Pennsylvania State Bureau of Forestry is under way to increase understanding of this dogwood disease. Until more is known, give dogwoods extra attention while they are in particular need of it. ♣

HOW TO KILL A TREE

Alan D. Cook

Reprinted with permission from *Flower and Garden Magazine*, February/March, 1983.

That's a ridiculous title, according to a literate friend who opined that no one would wish to kill a tree.

Essentially true. Surely ordinary human beings would not want to kill a tree. But kill trees they do. Actively and passively. My neighbors and yours. Many tree killings are unwitting accidents. Let's examine some of the ways people kill trees by accident.

How to Start

One way begins at the nursery, where healthy, strong-stemmed, well-rooted trees with take-me-home appeal are offered. Some of them may be genetically unable to endure the climate where the prospective purchaser intends to put them. The mismatch usually involves trees that are not winter hardy. A royal palm, for example, won't make it beyond Thanksgiving in a place like Fargo, N.D. But not everybody knows that.

A more sophisticated kind of mistake is to buy a tree that *does* grow in the area, but to get a southern-born form of it that cannot tolerate winters far north of its native range. Dogwoods collected from the hills of Tennessee, for example, may not survive in Pittsburgh, even though some dogwoods DO grow in Pittsburgh.

Conversely, northern natives usually need some winter rigors to satisfy inherent dormancy requirements. You could murder an Ohio red maple, for instance, by planting it in Atlanta. Red maples are native to both places, but those of Ohio need more of a cold period than Atlanta can give.

The nursery often holds many other potential victims, ready to die in alien climates. The winter-rugged balsam fir (*Abies balsamea*) and many other firs of northwestern climes will just pine away in the hot dry summers of the corn belt. Sourwood

(*Oxydendron arboreum*), a cousin of rhododendrons, will wane in alkaline soil.

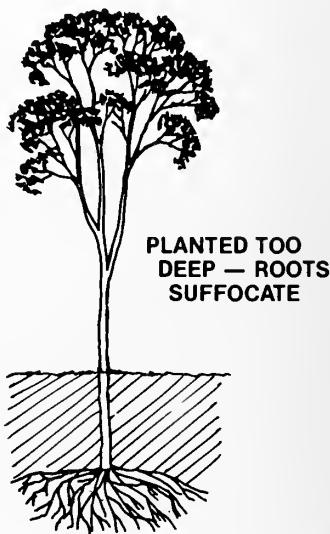
The local library, urban forester, master gardener, nurseryman—all could forewarn about such climatic mismatches. Yet many a gardener falls to temptation and brings home such doomed trees from a sidewalk sale in front of a drug or grocery store.

Even if the tree does not have the climatic strike against it, there are still several ways you could kill it by giving it adverse sites around your yard.

After You Get It Home

Pine trees (species of the genus *Pinus*) will not live long planted in the shade of maples.

Overhead wires? When the tree gets up there, a utility man on a cherry picker will likely hack away parts of it in a manner that murders beauty, and may bring the onset of decay.

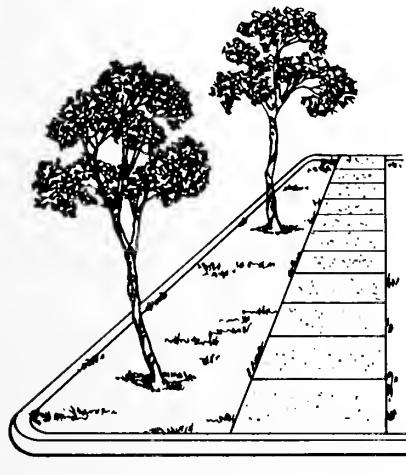


Drawings courtesy of Flower and Garden

Utility lines—water, gas, cable TV, sewer, electricity—often require excavations. Trees planted close by can sustain a lot of root damage. If the excavating comes too late, after a gas line pops a leak, the gas will annihilate nearby trees without waiting.

For a river birch (*Betula nigra*), a planting site on a dry bank will be fatal. For a sugar maple (*Acer saccharum*), a wet spot will be just as effective a killer. Canada hemlock (*Tsuga canadensis*) has trouble in a windy location.

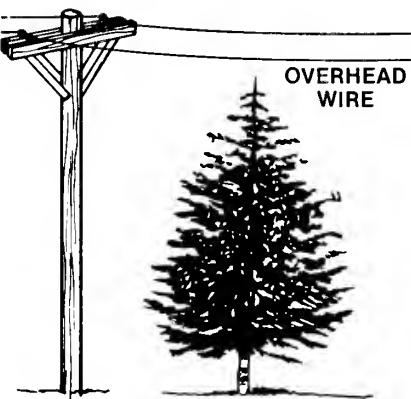
PROSPECTS ARE NEVER BRIGHT IN NARROW STRIPS BETWEEN SIDEWALK AND CURB



Prospects are never bright for trees planted in those narrow strips, sometimes only a yard or so wide, between sidewalk and curb in cities. If delivery trucks don't get them, restricted root zone will.

Adverse sites aside, you can kill the tree simply by planting it with its crown (where trunk meets root) a cozy five inches down into the earth. Many think such planting adds to the tree's comfort and stability, while in fact it has less chance than fried chicken at a picnic.

Another form of such killing is to dig a hole a lot deeper than necessary and incorporate a huge amount of peat moss or humus in the backfill. This way, the tree can be planted at the proper depth, but in time the soil will settle, lowering the tree into a

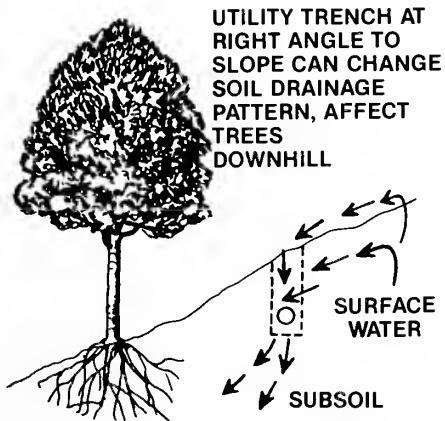


PIN OAK HEADED FOR TROUBLE

depression. In winter, water can collect in the basin, freeze and crush the cambium layer at the base of the trunk. The true cause of such mysterious deaths may never be detected.

Containers Can Be Lethal

In planting a container-grown tree, one may refrain from disturbing the root ball. But if so, chances are that new roots will not be able to penetrate the severe interface formed between the potting medium and the surrounding soil. It is always better to



UTILITY TRENCH AT
RIGHT ANGLE TO
SLOPE CAN CHANGE
SOIL DRAINAGE
PATTERN, AFFECT
TREES
DOWNHILL

loosen some of the roots of a pot-bound tree, so they can wander outward.

Or the container may be left on and planted with the tree. Surely, almost anyone would remove a metal or plastic pot, but the pressed fiber kind—which is supposed by some to decay in the hole and provide humus—is often left. This self-destructing pot may not work every time, or in time, and lots of trees have died with their pots on.

Plastics also can be lethal. Conventional burlap, even the green rot-proof kind, and hemp or sisal twine bindings on a root ball, if left intact, will probably rot before inflicting harm. But plastics won't. The tree is a goner if the plastic twine that secures the ball is not cut loose from the crown. Plastic fabric instead of burlap also is a real threat.

Garroded on Guy Wires

To keep the newly-planted tree upright, guy wires are often installed. Guy wires can hurt people (a separate subject), and they also—if applied in some ways, are certain to damage bark, maybe all the way around the trunk. A stealthy way of strangulation is to run the wires through cushioning sleeves of old garden hose, and then forget them for several years. As the tree grows, the rigging will do its dirty work.

Water and Chemicals

Everyone waters newly-planted trees, and some water too much. Willows (*Salix* species) and bald cypress (*Taxodium distichum*) tolerate standing water, and many other trees tolerate wet soil. But evergreen



trees and many deciduous species can be killed by overwatering.

On the other hand, not everyone remembers to come back and water newly planted trees a few months after the planting ritual. A summer or fall drought in its first season will kill almost any tree unless it is watered. If you don't water it by the time the lawn turns brown, it's probably dead.

Now for the killing of larger, mature trees. Diseases and/or insects, nutritional deficiencies, pruning needs, all have the possibility of killing, unless corrected.

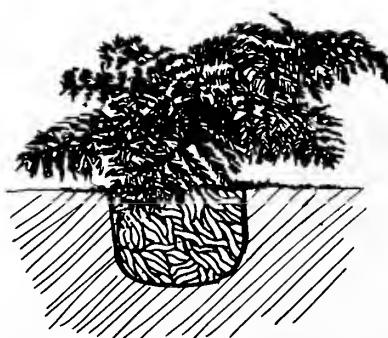
Defoliation by insects two or three years in a row will kill many kinds. For example, gypsy moths can do such work. Nevertheless, attempts to alleviate insect problems may cause larger problems. Use of the wrong pesticide, or overdoses by persons who read the directions only afterward, have troubled many a tree.

Weed killers are tree killers, too. There are lots of ways to kill trees with herbicides. Spraying on windy days tops the list.

Bad pruning can be worse than none. If stubs are left they will die, and decay will enter. Pruning tools that are not sterilized with alcohol after each patient can spread disease from tree to tree.

Even a blanket of mulch can turn malevolent. Recent studies indicate that a too-thick (more than four inches) organic mulch around a tree trunk may foster fungal cankers.

Mechanical damage to trees can come in many forms, and all contribute to ill health



CONTAINER-GROWN SPECIMEN PLANTED WITHOUT LOOSENING ROOTS TO LEAD THEM OUTWARD



BARBECUED TREE BRANCHES

and thence possibly to death of the tree. Mowers, snow plows, tillers, and string trimmers are effective tools for battering trunks or tearing up roots. Attaching mail boxes, fence wires, cleats for climbing, or political posters to tree trunks will not promote longevity.

How about setting up a barbecue grill under spreading branches and scorching some steaks each evening? Or burning the trash there? Burning the trash won't taste as good, but will hurt the tree more. Auto exhaust is an effective air pollutant, too, so have a care where you warm up the family car.

If there's a sidewalk nearby, a lot of salt will melt winter ice and the runoff will pickle the roots of a shagbark hickory (*Carya ovata*) or other salt-sensitive trees.

Soil and Drainage

We haven't even touched on the most widespread tree killer of all—the changing (for the worse) of soil and water conditions. Most soil is porous. The pores allow air, containing oxygen without which roots die, and water without which roots die, into the soil complex. Three tree-killing maneuvers at work in almost every community every day are soil compaction, drainage changes, and grade changes. In combination these are particularly murderous.

If soil is compressed, pores are eliminated. No pores, no air, no roots, no tree. "Soil compaction" evokes visions of bulldozers and dump trucks. These will compact soil, all right, but so will the Toyota, the golf cart, or a lot of little feet in a play-

ground. The result is the same whether the tamping is from one big tamp or many small ones.

Drainage changes are disguised in the forms of various respectable and necessary trades. Hire a man to put in a driveway, and he may create something better than a beaver's dam in changing the surface or subsurface movement of water. If water is trapped in a spot, air is driven out; tree roots have no snorkels, so they die. The workman installing a drainage tile or ditch, even quite a distance from a tree, may reduce normal water supply in the soil. Young trees may adapt, but a patriarch, too old and stubborn to change, may call it quits. Highway construction and other cataclysmic changes have killed trees long distances away. In some instances the demise occurs slowly over a decade or more.

Installment of underground utility lines may create drainage routes, too. If at right angles to the slope (along topographical lines), a trench of loosely backfilled soil can short-stop surface runoff water and lead it into the subsurface soil. Big trees thus subjected to increased soil moisture (decreasing the oxygen) can lose roots and lives.

Grade changes are famous for tree assassination. Just a couple of inches of clay-type fill dirt above roots of a sensitive tree like American beech (*Fagus grandifolia*) can smother it. The creation of a "well" of stone, brick or block in a six-foot circle around the trunk may look like a remedy, but it won't help the roots extending out beyond that inner circle, and they stand little chance in the long run.

The opposite kind of grade change is the removal of soil, and it's easy to understand the devastation inherent in that. Roots are lost, soil water is reduced for those that remain—a double whammy.

A wooded house lot, where a house is to be built among tall trees, offers plenty of potential victims. Most of the tree killing tricks I have mentioned can be practiced simultaneously during construction. The house is generally put directly beneath or beside the grandest tree on the lot. It may live, but likely will die within five years.

Even if the noble tree endures all the actions and inactions of its human neighbors, it still may not be spared. Lightning may strike it. ♫

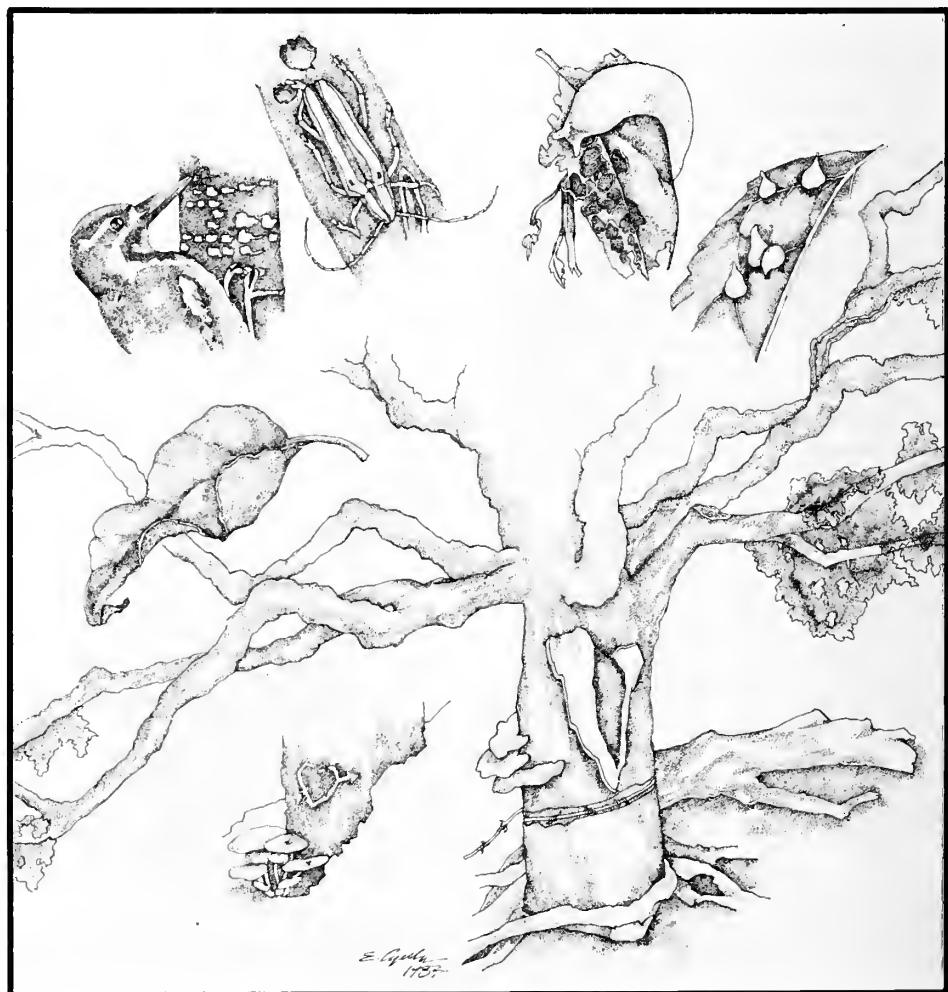
READING TREE LEAVES

Michael B. Trimble

Reprinted with permission from *American Horticulturist*, June, 1983.

When the leaves on a tree fall to the ground, it's a sure sign that some change is taking place in that tree's life cycle. The change may be normal—it's October and the lovely magenta leaves of your prize maple have fulfilled their purpose for the season; or the change may be abnormal—the leaves on

that same maple turn brown, shrivel and fall to the ground in July. Something seems clearly wrong, but what? Making one's way through the maze of clues left by the leaves of woody ornamentals (changes in their color, texture, shape or their loss altogether) can be confusing, but deciphering



the clues can also prevent the loss of a favorite—and valuable—addition to your garden. These changes may indicate the presence of injury, insects, diseases or adverse environmental conditions.

Deciphering the messages those symptoms convey is a skill that improves with practice. As gardeners, we certainly do receive ample opportunities to work upon our diagnostic techniques. The brief guide that follows should help you to recognize those abnormal leaf symptoms that may call for your intercession on a plant's behalf. This guide will also increase your awareness of the multitude of different factors that influence a plant's well being.

Foliar Symptoms and Nonfoliar Injuries

Any injury to a plant's roots, trunk or branches that interferes with the movement of water from the roots out to the leaves will invariably lead to symptoms of water stress, including leaves that are undersized and off-color, to leaves killed for want of water. Splits or cracks in the woody portions of a plant, cankers that expand to encircle trunks or branches, girdling roots or even wire that was wrapped around a trunk years ago and forgotten will impede a plant's ability to supply its leaves with adequate moisture.

You should also be aware of the role vascular diseases play in harming leaves. Various fungi and bacteria can enter a plant's xylem either through the roots or by way of injuries to the plant's bark. As they spread within the conductive tissues they plug them up, effectively preventing moisture from reaching the leaves. Desiccated, flagging leaves are a sure sign that for some reason those leaves are no longer receiving the water they need to survive. When one side of a plant suddenly wilts and will not recover when watered, a vascular infection may be responsible.

While you check a plant's root collar, trunk and branching for indications of physical injuries, watch for signs of insect activities that may have impaired that plant's ability to keep its foliage well watered. Holes in trunks or branches from which frass (sawdust often mixed with sap or resin) is expelled are sure signs of borer activity, while grubs or wireworms at a plant's base may indicate trouble in the root zone.

Foliar Symptoms and Environmental Stress

Assume you have a tree that was previously healthy but is now showing signs of distress. Its over-all appearance is poor, with leaves that are oddly shaped and off-color. The canopy is thinning and you are justifiably concerned.

Many of the non-foliar injuries mentioned above could have led to the current state in which this tree finds itself. However, a careful examination has uncovered no apparent injury that could account for the tree's decline. At this point, an examination of the conditions under which the tree is growing may yield the source of its distress.

There will be many occasions when the aid of a professional diagnostician will be needed to unravel the relationships between the foliar symptoms of environmental stress and the specific factors in a plant's surroundings that have caused stress. However, by using the following chart and your knowledge of a plant's habitat, you should be able to get a handle on what might be responsible for your plant's misfortune.

As you can see from this "stress list," there may be many different sources of environmental distress, although the foliar symptoms they induce are often quite similar. For this reason, the key to diagnosing which environmental factors have gone awry depends not so much on symptom analysis as upon a careful study of a plant's habitat. What changes have taken place in the plant's vicinity both prior to and during the occurrence of the foliar symptoms that first caught your attention? If you have a good grasp of the cultural history of a plant, you will be in a better position to determine what environmental factors may have adversely affected it.

Foliar Symptoms and Insects

There are a variety of insect activities harmful to leaves. Feeding on roots, boring into stems, transmitting diseases as they feed and feeding on the leaves themselves all come quickly to mind. The direct assault on a plant's foliage is probably the least harmful in terms of a plant's overall well being, but it does seem to command the bulk of our attention because of the visual distress such an infected plant causes us.

SYMPTOMS OF ENVIRONMENTAL STRESS

- 1. Drought** Leaves may appear scorched; if drought is prolonged, leaves in successive years may be under-sized and off-color. Tree canopies will be sparse. Heavily foliated trees will shed a portion of their leaves to reduce transpiration.
- 2. Nutritional Deficiencies** Leaves can be under-sized and off-color. Plant growth will be less vigorous, flowering curtailed. Stunting and similar growth deformities may result.
- 3. Herbicide Injury** Leaves will appear cupped or puckered; needles of evergreens may be twisted and malformed. New growth is particularly susceptible to herbicide injury. If exposure was light, afflicted plants will outgrow the problem.
- 4. Low Temperatures** Buds can be killed by low winter temperatures. This will lighten spring canopies and reduce flowering and fruiting on affected plants.
- 5. Late Spring Frosts** New leaves may appear to be burned or even shredded. As the season progresses new growth will appear normal. Late frosts can also damage fruit and flower buds.
- 6. Excess Water** When water gathers at a plant's base, roots can drown. As a result leaves will brown and afflicted plants will slowly die back.
- 7. Change in Grade** Adding fill over plant roots, especially of shallow-rooted trees, can suffocate those roots, leading to leaf browning and a gradual die-back of the canopy.
- 8. Toxic Poisoning** Toxic materials, originating from such diverse sources as septic tanks or road salt can lead to plant poisoning. Leaves may first appear scorched and will later be off-color and undersized. Plant death may eventually result.
- 9. Heat Scorch** Scorched leaves are common on trees growing in shallow soils. Street trees are frequent victims. Trees with shallow root systems are most susceptible.
- 10. Air Pollution** Depending upon the pollutant, leaves may appear to be scorched, streaked or display a glazed appearance. Different plant species often respond quite differently.



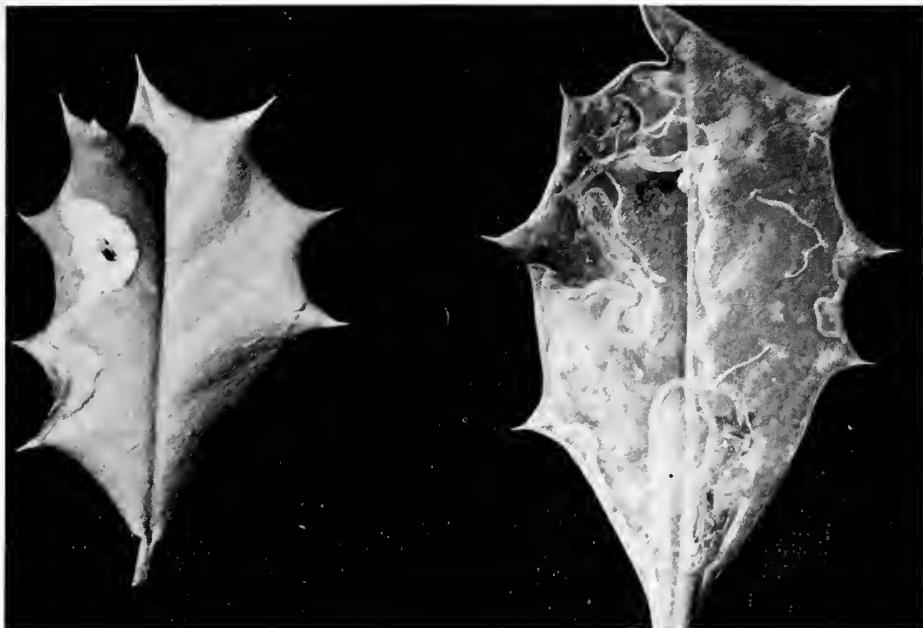
A. F. Rhoads

How an insect feeds on a leaf and the symptoms its feeding activities leave behind are discussed in the accompanying table.

If you cannot identify the insect devouring your leaves, or if it has moved on and left only its handiwork behind, the following three steps will help you name the troublemaker:

- Determine what feeding symptom you are dealing with (see the chart).
- Properly identify the species of plant that has been injured.
- Using a reference on insects that feed upon plants, look up the species of the plant

Marginal browning and curling on linden (*Tilia cordata*) from high soil salt levels in curbside planting wells. Fluoride pollutants cause similar symptoms.



Tunnels and blotches on holly leaves signal the presence of leaf miners.

INSECT RELATED INJURY

Insects Responsible

1. Chewing Leaves are eaten, displaying holes, ragged edges. On occasion just the upper or lower surfaces will be eaten, resulting in the leaf surface being covered with distinct brown spots.	Beetles; caterpillars; plant bugs; others.
2. Sucking Insects insert their mouth parts into leaves and extract the fluids. Afflicted leaves appear pale, often mottled or bronzy.	Aphids; mites; white flies; scales; mealy bugs; others.
3. Rasping Insects rasp and rupture leaf tissues and then lap up the released fluids. Leaves appear whitened, pale or mottled.	Thrips.
4. Leaf Mining Insects lay eggs on leaves. When the larvae hatch they tunnel into the leaf and feed on the contents between the upper and lower leaf surfaces. Leaves appear to have a brown, onion-skin type of look to their injured portions or will be riddled with white tunnels.	The larvae of certain flies, sawflies and moths are leaf miners.
5. Galls Insect feeding irritates the leaf tissues, resulting in abnormal growths of various sizes, shapes and colors.	Certain mites; wasps; flies; also certain fungi.

Obvious signs of an insect's presence include the discovery of insect eggs, larvae or nymphs, cast skins or adults. If no insects are present on a leaf, but symptoms of insect feeding are, it is possible that predators, heavy rainfall or some other natural phenomenon has eliminated the culprits from the leaf sample you are examining. If insects are present, don't be too quick to retaliate. Before doing anything hasty be sure the insects you have spotted are pests and not one of the many species beneficial to your plants.

SYMPTOMS OF FUNGAL INFECTIONS

Example

1. Anthracnose Affected leaves will usually have large, brown patches along leaf margins or between the larger leaf veins.	Maple anthracnose, <i>Gloeosporium apocryptum</i>
2. Leaf Blight May begin as a brown patch that spreads, eventually swallowing up the entire leaf, which then shrivels, often without falling.	Early blight of tomato, <i>Alternaria solani</i>
3. Leaf Blotch A catch-all category defined as a large patch or patches of brown upon a leaf, often without distinct borders. A leaf blotch ordinarily will not engulf the entire leaf.	Horse chestnut leaf blotch, <i>Guignardia aesculi</i>
4. Leaf Blisters Distortions or deformities in a leaf that may or may not be accompanied by a marked discoloration of the affected areas.	Peach leaf curl, <i>Taphrina deformans</i>
5. Leaf Spots Typically a brown spot with distinct margin, the margin often a darker hue than the spot itself. Spots can also be gray, black or shades of yellow.	Dogwood leaf spot, <i>Spetoria cornicola</i>
6. Needle Casts On evergreens, needles turn yellow, brown or reddish brown depending upon the plant involved. Infected needles will subsequently fall in most cases.	Needle cast of Douglas-fir, <i>Rhabdocline pseudotsugae</i>
7. Downy Mildew Infected leaves appear covered on their underside with a white felt. The upper leaf surface will eventually turn brown.	Grape downy mildew, <i>Plasmopara viticola</i>
8. Powdery Mildew The powdery white growth of this fungus will cover the surface of an infected leaf. Probably the easiest disease to identify.	Lilac mildew, <i>Microsphaera alni</i>
9. Rusts The initial infection will resemble a yellowish leaf spot. Eventually rusty-red spores will cover the spots. Many rusts require two alternative hosts, one to overwinter on and the other to summer on. On pines, needles first show yellow or tan spots. As the disease progresses, blisters appear from which the brightly colored spores are dispersed. On white pine, blisters will protrude through the bark as well.	Cedar-apple rust, <i>Gymnosporangium juniperi-virginianae</i> White pine blister rust, <i>Cronartium ribicola</i>
10. Leaf Scabs Similar to leaf spots except that a leaf scab will usually include a puckering of the infected areas.	Apple scab, <i>Venturia inaequalis</i>

SYMPTOMS OF BACTERIAL INFECTIONS

Example

1. Leaf Blight Leaves may first show numerous small spots that eventually coalesce to engulf the leaf; or a sudden wilting and blackening of a leaf may occur.	Fire blight on apple, pear, crabapple, hawthorn
2. Leaf Spots Leaf surfaces will be covered with spots that can take many varied shapes and colors, depending upon the plant species involved. Spots can become numerous enough to cause leaves to drop.	Bacterial spot of stone fruits, <i>Xanthomonas pruni</i>



Laurel leaf spot, a fungus, is similar to those that attack rhododendron and azalea. All can be controlled with appropriate fungicide.

injured in the index. Turn to the page indicated where there will be either a list of symptoms or a list of insects. If symptoms are given, find the symptom that matches your leaf trouble and which insect(s) are potentially responsible. If a list of insects is given you will have to read through the list until you arrive at the insect(s) whose described feeding habits match the injuries to your plant.

In diagnosing plant disorders, there is no substitute for comprehensive and accurate reference books (see end of article).

Foliar Symptoms and Foliar Diseases

A good many of the most frequently encountered leaf abnormalities can be traced back to the injurious activities of parasitic fungi, bacteria and a host of viruses. The symptoms produced by these pathogens include leaf spotting, growth irregularities and blights, to name only three.

The foliar symptoms associated with these pathogens can be placed into different groups according to their characteristics, just as the symptoms of insect feeding were grouped earlier. A further distinction based upon the type of pathogen responsible will also be helpful, and therefore fungi, bacteria and various viruses will each be treated separately.

Fungi

When a fungus attacks a leaf, the process normally begins by a fungal spore germinating on the leaf's surface. Warm, humid weather encourages germination. Once ger-

minated the fungus will send its hyphae (fungal "roots") in among the tissues of a leaf, "tapping" those tissues for nourishment and often killing them in the process.

The leaf tissues that are killed show up as the leaf symptoms that attract our attention. As a fungus kills leaf tissue, distinct patterns emerge, revealing a fungus' *modus operandi*. For example, the fungus that causes tar spot on maples, *Rhytisma acerinum*, always produces the same raised, black spots upon infected leaves. This symptomatic consistency is a gardener's best diagnostic friend when it comes to determining what disease organism has led to a particular leaf disorder.

The diagnosis of a leaf symptom will often be complicated by the presence of *saprophytic* fungi (fungi that only attack dead tissue), which are the essential decomposers of dead plant and animal tissues. The saprophytic fungi move in *after* the primary cause of a leaf's problems have done their damage. For this reason, the presence of fungi on an injured leaf is not automatically proof that a fungus did the initial damage.

The list of fungus-related leaf symptoms on the chart will help to identify which symptom you are dealing with. By using the same three-step process for tracking down the source of an insect-related feeding injury, you will usually be able to run down the disease responsible for a fungal-induced leaf symptom. In this case, you will also need a plant pathology book.

When tracing symptoms, don't be surprised if more than one fungus, or a num-

ber of fungi and bacteria, are listed as possible causes for a particular leaf symptom. If a closer look at the symptom offers no further information with which you can narrow the field of possible candidates, you will have to resort to the art of probabilities. Some diseases are much more likely to be active in your area than others, and on the basis of this information you will often be able to conclude with relative certainty which disease organism you are confronting.

As fungi grow they must eventually produce spores for the next generation. The reproductive organs that will produce those spores will protrude from the infected tissue of the leaf, enabling the spores to be more widely dispersed. Those so-called fruiting bodies are unique to each species of fungus and provide the basis for precise species identification. Using a hand lens you will often be able to spot these minute structures reaching up from a leaf spot or blotch. If the fungus has not yet entered a reproductive phase, infected leaf tissue suspected of hosting a fungus can be cultured in a laboratory until those fruiting bodies appear. This is the method pathologists use to ensure accuracy in diagnosing a fungal-related leaf disorder.

Bacteria

Bacteria can also enter a leaf's tissue and wreak havoc that will appear as symptoms you can identify. Many serious bacterial diseases, such as *Erwinia tracheiphila*, the wilts that can destroy squash or pumpkins and other members of the gourd family are spread by insects as they feed upon those plants. Others, such as a fire blight, *Erwinia amylovora*, overwinter on infected plant tissue, ready to spread on their own with the coming of spring.

The leaf symptoms of many bacterial disorders resemble symptoms of fungal infections. If the fruiting bodies that only the fungi produce can be found upon leaf tissue damaged by an unknown pathogen, you can often discount the presence of bacteria. You may also obtain clues by knowing the probability of a fungus or bacteria being more active in your area at that time.

Viruses

Viruses are an odd collection of tiny pathogenic organisms, and the leaf symptoms

they are responsible for make up an interesting collection of growth abnormalities that often involve foliar discolorations and deformities. Insects spread many viral infections as they feed, but poor sanitation when working among plant species susceptible to viral disorders accounts for disease transmission in far too many instances.

If a foliar symptom is associated with a marked discoloration of a leaf's surface, growth that is either stunted or deformed, then herbicide injury can be ruled out; if leaves appear mottled or exhibit patterned discolorations; or if any combination of these three symptoms is present, you should suspect some viral agent. Plant deformities such as witches-broom (an abnormal, brushlike growth of weak, closely clustered shoots or branches on a woody plant; they are produced by insects, disease or spontaneous mutation) can often be traced to a virus. If growth deformities appear on other parts of the plant, the possibility that a virus is responsible increases. In any case, confirming the presence of a virus will require the aid of a professional diagnostician. Take or send a sample of your troubled plant to your county extension office—something to remember for those times when we all get stumped and could use a helping hand.

Recommended Reading

There are several excellent books on the insects and diseases that attack woody ornamentals. The following books are worth considering for any library.

Destructive and Useful Insects. Metcalf, Flint and Metcalf. McGraw-Hill. 1967. This is a textbook with very helpful keys to insects based on the injuries they cause.

Diseases and Pests of Ornamental Plants. Pirone. Wiley-Interscience, Publishers. 1978.

The Gardener's Bug Book. Fourth Edition. Westcott. Doubleday. 1973.

Gardening without Pests, Handbook #89, Brooklyn Botanic Garden, 1979.

Insects That Feed on Trees and Shrubs. Johnson and Lyon. Cornell University Press. 1976. This is an excellent photographic reference.

Westcott's Plant Disease Handbook. Fourth Edition. Westcott. Van Nostrand Reinhold. 1979.



Members' Seed Dividend

Seeds of cardinal flower (*Lobelia cardinalis*), a herbaceous perennial, are available to Members of Brooklyn Botanic Garden this spring.

Striking deep red blossoms appear on 2-to-4-foot stalks in mid- to late summer. Plants grow well in sun but also thrive in light shade. Extra watering helps, but cardinal flower is a short-lived perennial, so save a few seeds of this native each autumn for restarting every year. (See page 36 for propagation information.)

If you wish seeds, please send a stamped, self-addressed envelope (marked "hand cancel") to the Editor, Brooklyn Botanic Garden, 1000 Washington Avenue, Brooklyn, NY 11225. 



Rosa rugosa

A heritage rose collector...

IN LOVE WITH CELLAR HOLE ROSES

Wayne Worcester

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Malcolm Lowe's time has finally come. After all those years when so many other rosarians were busy with modern hybrid teas, grandifloras and floribundas, this microwave engineer and self-described "rose nut" in Nashua, New Hampshire, was falling in love with the roses of yesterday. Often found still growing around the foundations of abandoned farms, these hardy plants have been nicknamed "cellar hole" roses. Lowe studied, researched and learned how to identify and photograph old garden roses, and he became adept at propagating and nurturing them to show quality.

No modern rose was ever as aromatic as some of these; a single fresh blossom of Ma-

dame Ferdinand Jamain, the tender red hybrid perpetual (a rose that blooms continuously through the season) that's the original American Beauty Rose, can practically fill an entire room with fragrance. And as roses go, the old garden varieties are generally more disease-resistant and hardier by far than any of their modern counterparts, especially in New England, which even has soil that suits them quite well.

"The Victorians loved them," says Lowe, president of the New England Rose Society, "and there was a period of enthusiasm for them in the 1930s, '40s and early '50s; but roughly 30 years later, by 1980, there was only one nursery left in the entire

country growing and selling old garden roses. Now people want them. I've had people stop by from 400 miles away on a weekend just to buy a few bushes. All of the old farmer's journals speak of 'dooryard' roses, grandma's roses. That's what a lot of people want now, the fragrant roses they remember from childhood.

"Nine times out of ten, it was *Rosa gallica 'Officinalis'*, the Apothecary Rose grown for centuries around Provins, France, or *Rosa gallica 'Versicolor'*, ('Rosa Mundi'), which is probably still the very best of the striped roses.

"If it was a yellow rose, it was either *Rosa harisonii*, Harison's Yellow Rose, which is what's known as the real Yellow Rose of Texas, or *Rosa foetida 'Persiana'*, the Persian Yellow Rose. These are the double yellow roses that the settlers took westward from New England, New York and Pennsylvania.

"We're right in the middle of a renaissance where the old garden roses are concerned, and I must say, it's just in time. By the end of every cycle of apathy, Lord knows how many varieties have been lost. If a rose lover retires or dies leaving a great collection, too often it is left to die off. Sometimes valuable information or identification goes with him. Fortunately, small specialty nurseries have started to spring up all over the country again, and the same thing is happening in Europe, too. Still, demand is way ahead of supply right now."

By mail, Lowe sells about 1,200 young bushes each year, not grafted to common understock but, for reliability, custom-grown on their own roots for eighteen months before shipping.

Choosing and Growing

There are literally thousands of varieties of roses and though many are old, not all qualify as old garden roses or heritage roses. Heritage roses are generally taken to be the centifolias or cabbage roses, moss roses, chinias, teas, noisettes, rugosas, gallicas, damasks, hybrid perpetuums, hybrid musks, bourbons, albas and species, or wild, roses.

Most old garden roses—especially those

that bloom only once a year—are easy to maintain. "The same basics of rose care apply to the old garden roses," Lowe says, "but there's less to worry about. A slightly acidic soil, say from pH 5.5 to 6.5, is right, but they're not terribly fussy about it. Full sun is best, or at least six good hours of sunlight, although the hybrid musks do need some shade.

"Before I plant, particularly if I've bought the rosebush by mail, I soak it for 48 hours, submerge the entire plant in water to which I've added a very, very small amount of liquid fertilizer, usually Miracle Gro or RapidGro. In a 55-gallon drum full of water, I use only about one tablespoon of fertilizer.

"I always plant in the fall so the bush will have a good long time to establish a strong root system before it has to start pushing for canes and foliage and blossoms. By planting in the fall you don't have to cut the plant back the way you do in the spring. Why cut good, growing wood if you don't have to?"

To prevent desiccation, Lowe always



The gaily striped 'Rosa Mundi', an ancient, still-popular Gallica rose.

CATEGORIES OF OLD GARDEN ROSES

ALBAS, *Rosa x alba*

These hardy roses, a cross between *Rosa gallica* and a form of *Rosa canina*, were known within 100 years of the birth of Christ. Flowers are white to blush pink. Growth is dense and vigorous. Flowers are delicately shaped and fragrant. A good choice for trellis or fence because they will push to six or seven feet. (Konigin von Danemark; "Maiden's Blush;" Cuisse de Nymphe; Madame Legras de St. Germain.)

BOURBONS, *Rosa x borboniana*

Discovered in 1819 on the French island known today as Reunion, it is a cross of the Autumn Damask and Pink China. Fragrant flowers are compact and vigorous with very full, tissuelike petals. Plants grow to five feet. (Louise Odier; Prince Charles; Variegata di Bologna; Souvenir de la Malmaison.)

CENTIFOLIAS, *Rosa x centifolia*

Among the hardiest of all old roses. Nickname "Cabbage rose" derives from general shape of its huge, fragrant blooms. Developed by Dutch growers in the late 16th and 17th centuries who crossed Damasks and Albas. Usually pink flowers with deep centers. (Blanchefleur; Petite de Hollande; Robert le Diable.)

CHINAS, *Rosa x chinensis*

Everblooming bushes that, like the teas, do best in mild climates and must be protected if grown in New England. Brought to Europe from China in the late 1700s. Flower has peppery fragrance and small red or pink, usually semidouble, blooms that darken with age. (Brennus; Fellemburg; Old Blush.)

DAMASKS, *Rosa x damascena*

Favored for centuries for exceptional fragrance and treasured as the prime source of attar of roses, the pure distillation of rose oils so valued in the making of perfume. Flowers are double or semidouble white to pink and red on tall, thorny canes. (Ispahan; Madame Hardy; Rose de Rescht 'Autumn'; Rose des Quatre Saisons, *Rosa damascena* 'Semperflorens'; York and Lancaster, *Rosa damascena* 'Versicolor').

GALLICAS, *Rosa x gallica*

Among the oldest of all roses, the French rose was cultivated centuries before Christ

and used for hundreds of years in the manufacture of medicines and perfumes. Predominant color is red ranging almost to purple. Flowers may be single, semidouble, or double on canes that are nearly thornless. (Belle Isis; Charles de Mills; Complicata; Apothecary Rose, *Rosa gallica* 'Officinalis'; 'Rosa Mundi').

HYBRID MUSKS, *Rosa x moschata*

Technically not an old garden rose, being a cross between noisette and *Rosa multiflora* rambler. A diverse group ranging from sprawling shrubs to moderate climbers offering rich, fragrant, repeating pink, red, yellow, and white flowers that bloom in trusses. (Erfurt; Nur Mahal; Robin Hood.)

HYBRID PERPETUALS

The lush mongrels that were the rage of Europe in the mid-1800s. Portland damasks, Bourbons, Chinas, and Teas all figured in the parenting of the Hybrid Perpetual. Strong and vigorous plants with big, fragrant flowers in a wide array of colors, from white to nearly purple. (Baronne Prevost; General Washington; Madame Victor Verdier; Reine des Violettes.)

MOSS ROSES, *Rosa x centifolia* 'Muscosa'

Much like the cabbage roses, from which they were developed near the end of the 17th century, except for the soft, mossy growth covering calyx and stem and giving the type its name. Flowers are most often large, fragrant, and pink on thorny, five-foot canes. (Common Moss; Madame de la Roche-Lambert; Violacee.)

RUGOSAS, *Rosa x rugosa*—see page 10.

SPECIES or WILD ROSES

A very broad category including roses from throughout the Northern Hemisphere. Invariably they are disease-resistant and winter-hardy. *Rosa palustris*, the Swamp Rose, is one of the very few roses that will thrive in damp soil; it yields an abundance of bright pink flowers on bushes growing to eight feet. *Rosa foetida* 'Persiana', the Persian Yellow Rose, produces double blooms in profusion and is among the least temperamental. *Rosa eglanteria*, one of the best of the eglantine sweet-briars, is a perfect choice for trellis or fence because it will push up to 12 feet, yield light pink flowers and foliage that smells like ripe apples.



A late spring-blooming rose, *Rosa alba* can be white to pale pink and will form a substantial sized shrub.

mounds up or completely encloses a new bush for about one full week. Through the growing season he drenches the ground around each bush with at least five gallons of water every week. "It's better to saturate the soil than just feed it a little water every couple of days.

"Drainage is also very important. I had a friend who bought property that looked perfect for roses. He planted a lot of nice bushes only to find that the land was chock full of granite ledge, actually encircled by it. He lost every bush; they all drowned."

To retard weed growth and retain the moisture his roses need through drying winds and summer heat, Lowe mulches his beds with three or four inches of old, dry cow manure, which he says is the best possible mulch for roses. "Wood chips, shredded bark, pine needles, even peat moss all need nitrogen as they decompose, and they take it from roses. If you use any of those materials as mulch, you have to be careful to replace the nitrogen they consume. Cow manure has some nitrogen of its own, so the loss isn't severe, and it adds good fiber to the soil."

For once-flowering old garden roses, Lowe also digs one-and-a-half cups of bal-

anced fertilizer, usually 10-10-10, into the soil around the base of each well-established plant in late April and then again after bloom in early summer to replace the nutrients that the plant's profuse blooms have used. He never feeds a rosebush after July.

Old garden roses are subject to mildew and black spot, the same diseases that afflict all other varieties. "The big difference is, being so hardy, the old garden roses take it much better. If the plant is healthy, it's not apt to die or even be hurt seriously by it. The average home gardener can get by quite nicely just using all-purpose fungicide treatments.

"What you have to look for with the old garden roses is spider mites. Adding a few drops of soap to the spray will kill the mites' eggs. If there's a real infestation, malathion should take care of it."

As for Japanese beetles, which can lay waste every little blossom in a New England summer, Lowe recommends that gardeners pray. "One of the nice things about once-flowering old garden roses is that most are through blooming by the time the Japanese beetles really get going around the Fourth of July.

"If you're raising a repeating variety, you

might consider just pruning the summer buds off as they form and going for a good fall flush. The beetles will be through their six-week cycle by then. If you use bait traps, don't put them in the middle of the rose bed; they attract beetles, remember. Put them a safe distance away; in fact, the best thing you can do is give a bunch to your neighbor."

Winter Protection

There are a number of good ways to protect roses in winter, but some of the best old garden roses need no protection at all. "Once-flowering albas, rugosas, damasks, centifolias, gallicas and most mosses you can just forget about," Lowe says. "They'll be fine.

"Most hybrid perpetuums grown outside of Cape Cod and north of Route 128 need winter protection, as do the chinas, some of the Portland damasks, bourbons, hybrid musks and any of the varieties that repeat, except the rugosas. Save the teas and most noisettes for a greenhouse."

Mounding up (covering the entire bush with soil) in late fall is probably the oldest way to protect a rose in winter, but there are other equally effective methods. Insulating rose cones are convenient, relatively inexpensive and available from most garden shops. Lowe makes two-foot-high boxes of Homosote, fibrous insulating board available in large panels from most building-supply stores.

Lowe prunes his roses only in early spring "when the forsythia blooms. They're the perfect ecological clock. If you follow the bloom of the forsythia, you're never pruning too early and you're never too late." Old garden roses should be pruned very lightly. Take out the dead wood, but scrape off a little of the bark on a cane before you cut it; if there's green underneath, leave it alone. "Never prune an old garden rose more than you have to," Lowe says.

To ensure the bush's health, Lowe dresses all cuts. A few drops of green food coloring added to a small bottle of white glue, like Elmer's, gives him all the dressing he needs—and it doesn't leave the rosebush looking as though it's been stricken by pox.

Of all the questions about roses that Lowe is called upon to answer, the one posed most often is, "Which are best for a fragrant potpourri?"

Most roses are aromatic to some degree, but the gallicas and damasks reign supreme.

"The pinks and whites are fragrant, but the reds especially are very, very fragrant, and they hold the fragrance through drying."

About five years ago Lowe stopped growing roses specifically for their fragrance. That's when he discovered that he'd developed an allergy to rose pollen. "It's terrible," he says. "If I put my nose down to the blossom, sometimes by the time I straighten up my eyes are watering, I'm all stuffy, and I start sneezing. It really makes my work a labor of love."

Where To Buy Old Garden Roses

Virginia Hooper/Joyce Demits
16831 Mitchell Creek Drive,
Fort Bragg, CA 95437
Send \$1 for listing

Lowe's Own-Root Roses
6 Sheffield Road,
Nashua, NH 03062
Send \$1 for listing

High Country Rosarium
1717 Downing Street,
Denver, CO 80218
Send \$1 for listing

Pickering Nurseries
670 Kingston Road,
Pickering, Ontario, Canada L1V 1A6
Send \$1 for listing

Roses of Yesterday and Today
802 Brown's Valley Road,
Watsonville, CA 95076
Send \$2 for catalog

The best sources of information on specific varieties of old garden roses are the people who raise them and are constantly involved in efforts to keep them in currency. The Heritage Roses Group, a subsection of the American Rose Society, is an assemblage of exactly such people.

The coordinator in the Northeast is Lily Shohan, RD 1, Clinton Corners, NY 12514.

Inquiries from outside the Northeast should be directed to the group's general coordinator, Jerry Fellman, 947 Broughton Way, Woodburn, OR 97071.

The most complete listing of old garden and modern roses and where to find specific varieties (when the answer is known) is the Combined Rose List prepared every year by Beverly R. Dobson, 215 Harriman Road, Irvington, NY 10533. Copies \$5.00 each. 

WHY PLANTS FAIL TO BLOOM

Carl A. Totemeier, Jr.

Reprinted with permission from *Old Westbury Gardens News*, Summer, 1983.

The failure of one's plants to bloom is a common concern among gardeners. This may occur for a number of reasons, some resulting from poor cultural practices and others beyond the gardener's control.

Lack of cold hardiness stands high on the list. A plant's inherent ability to withstand cold temperatures varies greatly from species to species and from plant to plant within a single species. Overwintering flower buds are often the least hardy of the exposed plant tissues. By way of example, rhododendron enthusiasts are well aware of the inherent cold tolerance of the various species and hybrids through published literature, yet there is always the temptation to grow those which are too tender for one's region. The result will be failure to bloom when the winter temperature has fallen below the level of tolerance.

Damage from excessively cold temperatures may also occur when the opening blossoms of an otherwise hardy plant are caught by an exceptionally late freeze.

It is not uncommon, especially among young, vigorous plants, for overstimulation of vegetative growth to result in failure to bloom. Excessive amounts of nitrogen fertilizer frequently cause this problem. To a lesser degree, overwatering may lead to the same result. Whatever the cause, the problem occurs when the carbohydrates produced by photosynthesis are exhausted in growth, leaving none available for flower bud initiation.

Not Yet Ready

Closely tied in with this is the phenomenon of juvenility. When propagated by seeds, most trees and shrubs pass through an initial juvenile period of rapid growth. This is less apt to occur in plants propagated by cuttings or grafts from mature, flowering stock. Avoidance of overstimulation of vegetative growth will often shorten the juvenile period and hasten flowering. Root pruning a week or so prior to the time when buds are normally formed will

sometimes hasten maturity and flowering.

Some plants exhibit characteristic features which enable one to tell whether they are juvenile or mature. The common English ivy, *Hedera helix*, changes leaf form from lobed or pointed leaves to rounded or smooth-edged leaves as it matures. This will also be accompanied by fall flowering and the production of small, blue grapelike fruits in the spring. The determining factor in ending juvenility in this case, however, is that of providing something on which the vine may climb. Those ivies which climb will eventually develop mature characteristics; those which remain prostrate on the ground will remain forever juvenile.

Shade, Drought, Disease

Another cause of failure to bloom is excessive shade. Even planting the shade-tolerant native dogwood, *Cornus florida*, in shade rather than full sun will result in fewer blooms. This is not to say that, in this example, the tree itself might not do better in partial shade.

Lack of water at critical times, including late summer through winter, may result in failure to flower. However, a slackening of the water supply just prior to flower bud development may slow vegetative growth and enhance flower bud initiation.

Diseases such as botrytis or gray mold may attack the developing flower bud, usually during humid and cloudy weather, resulting in blackened buds and is quite common with tulips and herbaceous peonies. The failure to clean up contaminated material from the previous year is a common source of the disease.

Lastly, when early spring flowering trees or shrubs are pruned prior to flowering, flowering will be reduced. Excessive pruning will, therefore, eliminate flowering for that season. Those trees and shrubs which flower from mid-June on do not flower from overwintering flower buds and may be pruned moderately prior to flowering with no detrimental effect. ☘



Aquilegia canadensis

WILD FLOWERS TO GROW FROM SEEDS OR CUTTINGS

William E. Brumback

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In the resurgence of perennials, native American plants have become extremely popular. Commonly used in borders, these wild flowers usually flourish with little help. In fact, restraining them can be more of a chore than increasing their numbers. Many species are excellent in great masses, both in sunny borders and shaded woodlands. If a few simple propagation techniques are followed, great numbers of plants can be produced in a relatively short period of time.

The three main methods of wild flower propagation are seeds, cuttings and divisions. While seeds of some plants germinate within three to four weeks in warm soil, oth-

ers have internal dormancy (an inhibition to germination). By giving these seeds a period of time in moist cold soil, germination is achieved in much the same way as if the same seeds were left outdoors naturally.

Seeds

With either type of seeds the first step is to sow them on a moistened, well-drained soil mixture in a pot or seed flat. A good mix is one part peat-light mix (Jiffy Mix or Redi-Earth are two commercially available mixes), one part peat moss and two parts sand (unsalted, of course) or fine gravel for drainage.

After sowing, cover seeds to a depth of

one-quarter to one-half inch with either soil mixture or sand. Water the container carefully as necessary to keep the medium moist. If seeds have no internal dormancy, they will pop up in four weeks in warm temperatures.

The best time to sow this type of seed is in early spring (a couple of frosts on ungerminated seed won't bother them at all) so that newly-germinated seedlings get a head start on the growing season. If the seeds have an internal dormancy, sow them outside in November or early December and leave the flat outside all winter at the mercy of the elements. As long as seeds remain moist (and they will under snow), natural freezing in winter followed by spring's gradual freezing and thawing is usually the best stimulus to germination.

Alternatively, a flat of seeds can be watered, allowed to drain, enclosed in a plastic bag and placed in a refrigerator (35 to 40 degrees) for three months before being brought into a warm sunny place to germinate. This period in the refrigerator also overcomes the seeds' dormancy, but be careful to time sowing correctly. Unless you have a greenhouse or indoor growing area, you could wind up with hundreds of seeds at a time of year when you are not prepared to handle them. As seedlings grow, transplant them into larger containers or into the garden as soon as they are large enough to handle. (Often young plants can be left in flats for transplanting in their second year.)

Seedlings should be given protection their first winter. They are able to survive freezing with little damage, but need cover from severe cold with a heavy mulch of hay or leaves. A cold frame is excellent, but not essential.

Either type of seeds, whether requiring cold to germinate or not, can be sown directly into a "nursery" seed bed in the garden so young plants can grow one full year (and attain larger size) before they are transplanted. Or seed of some species can be sown directly into their desired location if soil is kept moist and weeded. But be careful—it is easy to weed out these young plants by mistake.

Cuttings

Some species can be propagated by stem cuttings taken in late spring or early summer. Take the tips of stems about three to four

inches long and remove the bottom one-third of the leaves. Stem ends are dipped into a weak rooting powder (Hormoroot or Rootone F are two brand names). Cuttings are placed in a container of sand to that one-third depth. Water the cuttings, enclose the container in a plastic bag to keep in humidity and place it in a well-lit area that receives no direct sunlight. In about five weeks the cuttings will be rooted and the plastic bag can gradually be opened and finally removed as the small plants adjust to life on their own roots.

Divisions

Not all species can be successfully divided, but division of established plants is often the simplest method of increasing wild flowers. In the great debate over whether to divide in spring or in fall, I lean slightly towards early spring division since the dormant buds for the new year's growth are often more easily seen and a better judgment as to the size of the division can be made. Also spring division avoids winter heaving. When dividing plants, make sure a large root system accompanies the division and that moisture is provided.

Plants to Propagate

Given these three techniques, here are a dozen native plants that are easily propagated:

Wild columbine (*Aquilegia canadensis*) carries red flowers on one and one-half foot stems in May. Provide a well-drained, limy soil in shade. Seeds germinate within three weeks if temperatures are over 60 degrees. Sow them inside the house in a warm, sunny place in March and seedlings can be placed in the garden the same year to bloom the next.

Jack-in-the-pulpit (*Arisaema triphyllum*) is a classic native American plant for a shady garden. The flower is an interesting hooded bloom followed by red compound fruits in fall. The seeds inside these red fruits have no internal dormancy. If immediately cleaned from the red pulp and sown in a warm place, they germinate within two months. Seeds can also be allowed to dry then sown outside in spring, but germination will be slightly less. If seeds have dried out, a moist cold period seems to be beneficial. Simply sow seeds in a flat leaving it outside for winter or

enclose the flat in a plastic bag in the refrigerator for two to three months before bringing it into a warm area for planting and germination. Seeds can also be pressed into the ground where they are to grow. Probably three to four growing seasons will be required before blooms appear. Also young plants become dormant early in summer; don't make the mistake of thinking they have died—they will return.

Butterfly weed (*Asclepias tuberosa*) has orange flowers which are welcome in any sunny garden in June or July if planted in sandy well-drained soil. Sow seeds in spring and you will have dozens of blooming-sized plants in three years. Transplant the second year before they become too large.

False blue indigo (*Baptisia australis*) is a June bloomer with blue flowers on four-foot stems. This plant has a deep tap root and, like the above species, it is difficult to transplant when full size. Sow seeds outside in spring and transplant to the garden the second year to bloom the third year.

Green gold (*Chrysogonium virginianum*) is a neat groundcover with yellow flowers throughout late spring and summer. Stem cuttings (avoid those from flowering stems) root easily within four to five weeks and can be planted immediately if watered until thoroughly established. Seeds are scarce, but clumps can be divided almost any time.

Dwarf crested iris (*Iris cristata*) is an eight-inch plant that produces blue flowers in May. It quickly spreads to form a solid mat. Division can be accomplished at almost any time during the growing season as long as roots are present on each of the knobby rhizomes. Seeds collected as soon as ripe and sown outside germinate with variable success the following spring and take at least three years to produce blooming size plants.

Gay feather (*Liatris pycnostachya*) is often used in the perennial border. This wild flower has three-foot-tall purplish spikes in July and August. Seeds collected in September and sown in spring germinate easily. Plants can be transplanted the same year or second year to bloom the third. Pieces of round rhizomes that contain three or four buds can be broken off in spring and replanted.

Red cardinal flower (*Lobelia cardinalis*) is ideal for a sunny, wet area. This plant has spectacular three foot spikes of red in August and September. Since seeds must have a

cold, moist period before they will germinate, sow them outside in November to germinate the following spring. A seed flat can also be brought inside in January for a head start on the growing season, but be careful not to sow too heavily since seeds are tiny and overcrowding is likely to result. Seed flats can also be enclosed in a plastic bag in the refrigerator.

Creeping phlox (*Phlox stolonifera*) forms a solid mat of bluish-mauve in May and is easily propagated from four-inch stem cuttings in spring. These can be planted out the same year. Rooted runners can be taken off plants. Seeds seem to be sparsely produced and are not really worth the trouble since plants can be divided almost any time in the growing season.

Perennial black-eyed Susan (*Rudbeckia fulgida* var. *sullivantii*) has brilliant yellow daisies all summer long. Seeds need a cold period to germinate and are best sown outside in November. Transplant seedlings their second year to bloom the third. Established plants can be divided in spring.

Bloodroot (*Sanguinaria canadensis*) produces white flowers in earliest April, making this plant desirable in the shady section of the garden. The brilliant red rhizome that gives the plant its common name can be divided easily in spring or fall (whenever the plant is dormant). Be sure to leave two or three buds of each division for best success. Seeds can be difficult to germinate especially if allowed to dry for any length of time. If sown as soon as collected about thirty percent will germinate the following spring, but more will follow the second spring. Keep an eye out around parent plants for seedlings that can be moved when desired.

Foam flower (*Tiarella cordifolia*) is a great groundcover for light shade. It produces white flowers on eight inch stems in May. Seeds germinate without a cold treatment, but be sure to protect plants over winter. This plant sends out leafy runners that often root and can be moved where desired. Stems can be rooted if soil is kept moist, or divided in April.

A source list of nurseries dealing in native plants and seeds can be obtained for \$2 (\$1.50 plus 50 cents postage) from the New England Wild Flower Society, Garden in the Woods, Hemenway Road, Framingham, Mass. 01701. *



E. Scholz

Magnolia grandiflora growing in China

NORTH AMERICAN PLANT IMMIGRANTS

Xu Yaoping

Reprinted with permission from *China Reconstructs*, September, 1983.

It's always a surprise when one runs into a next-door neighbor under a foreign sky. The North American visitor to China has this in store for him. He may meet a number of old plant friends, though the sight of them may seem so natural that he may not realize that they are not native also to China, but have been introduced in the recent period or have found their way here at some time lost in history.

On landing at Beijing Airport, he will find the corridors and waiting rooms decorated with magnificent yellow blooms of the plains coreopsis (*Coreopsis tinctoria*) which grows on the U.S. plains from Nebraska to Minnesota. As our visitor travels into the city proper, he will find the streets shaded not only by the Chinese poplar (*Populus laiocarpa*), but also by the American green ash (*Fraxinus pennsylvanica*). These are two of the major species lining the avenues of Beijing and other cities of north China. In the lobby of his hotel he may meet old standbys like the century plant (*Agave americana*) and prickly pear (*Opuntia*), and

on the grounds, the tulip tree (*Liriodendron tulipifera*).

The lotus, thought to have originated in south Asia, has been closely linked with Chinese culture since Neolithic times, so you'd think China would have enough lotuses. But no, there in the ponds is another variety—the yellow American lotus (*Nelumbo lutea*).

For the past two decades or so, the edges of the roads in many parts of China have been planted to a fast-growing shrub whose roots serve to hold the edges of the ditches, and whose straight branches are cut off each autumn to be woven into baskets and hamper for produce. Few North American visitors who observe these rustic baskets—and probably even fewer of the Chinese peasants who wove them—know that the bush from which they are made is an American plant—the false indigo (*Amorpha fruticosa*). But lack of precise information on when it was introduced shows that there is still a lot of study to be done in this field.

When she saw a witch-hazel bush bloom-

ing in China at Christmastime, it made her feel homesick, tourist Demi Lloyd wrote her China Travel Service guide, but now back in the U.S., she said, the sight of the witch-hazel made her nostalgic for China. She regretted that her itinerary was too full to allow time to find out about American plants in China. Had she, she would have learned that it was indeed an American witch-hazel (*Hamamelis virginiana*) she saw in flower. While there is a variety of witch-hazel native to China, it is not very important. The American variety has been imported and can now be seen beautifying parks and gardens.

Dahlia—One of Earliest

Columbus' arrival in the Americas is datable, but no paleobotanist seems to have been able to trace the exact times certain plants from North America reached China. It is commonly accepted that the dahlia, originating in the high plateau of Mexico, was among the earliest plants from that continent to be brought to China. It traveled to Europe in the 18th century and from thence to East Asia.

At least 200 years ago it was already being mentioned in Chinese writings. Many of the best garden types were favorites with Chinese horticulturists in the Qing dynasty (1644-1911), such as the Double Decorative with quilled rays, the closely-packed Show, the Pompon, the Duplex and the Peony-flowered and Anemone-flowered. Now 500 of 7,000 known varieties of dahlia can be found in China.

Then there is the trumpet vine. Only two species of this orange-flowering climber are known, one a native of East Asia and another which grows in North America. Some paleobotanists think that when the climate was warmer and the two continents were connected by a land bridge at the Bering Strait, the Asian trumpet vine may have found its way across, as did the earliest Americans, but they have no proof. Because Chinese botanists wanted to have both species, the American trumpet vine (*Campsis radicans*) was introduced into China.

Twentieth-Century Introductions

Research on when and how certain plants first came to China has been hindered by the lack of Chinese equivalents for the Latin

names, which has led to confusion in comparing Chinese with Western specimens. There was also a lack of any accepted standard of definition of terms in Chinese to convey certain botanical ideas.

Taxonomists started having extensive contacts with the West only in the first decade of this century. By 1917 the famous Chinese botanist Qi Tianxi could write: "Explorers and students of botany from all over the world have taken much interest in the Chinese flora, and many large herbaria have furnished material to the specialists who have worked out very thoroughly the systematic side of our flora, and we now know, with a high degree of certainty, the Latin names for a very large number of Chinese plants." This was in an introduction to *A Complete Dictionary of Botanic Terms*, published in that year.

Not until around that time were meticulous records of plant introductions kept. A specialist in this area is Chen Junyu, a professor at the Beijing Forestry Institute and an adviser to the Beijing Botanical Garden. He showed this reporter around the garden during a recent interview and supplied details for every plant we encountered.

Most North American plants, he said, came to China by way of Europe during the twentieth century, mainly through the efforts of individuals. The black locust (*Robinia pseudoacacia*), for instance, was brought to China's Shandong province by a German missionary who thought the wood could be used for railway ties. It was actually tried out in Qingdao and in a few spots in Beijing. The tree is now widely distributed throughout the capital. The government recently appropriated funds to preserve one of the earliest black locust groves, in Beijing's Yuyuantan Park, at the suggestion of the China Botanical Association.

Concerted efforts to introduce plants from abroad began only in the 1950s, when China was striving to overcome the destruction of the Civil War. For the purpose of promoting worldwide plant exchange and conducting experiments in domesticating wild plants, the Beijing Botanical Garden was set up under the Chinese Academy of Sciences in 1956. Located at the foot of Fragrant Hill northwest of Beijing, the 60-acre garden has functioned as the major transfer point for plants from abroad bound for var-

ious parts of China, particularly the north. It now has over 3,000 different kinds, including about 100 from North America, which are growing successfully.

Introducing American Conifers

Large-scale exchange must proceed slowly. Much time is needed for studying adaptability to the new soil and climate, and for breeding in large numbers. Examples are the Douglas fir (*Pseudotsuga menziesii*) and eastern white pine (*Pinus strobus*). They were brought to China very early, but not until the late 1970s could botanists, after studying their growth in Beijing and seven provinces, conclude that these trees had strong adaptability to the humid and semi-humid-temperate and warm-temperate climate in different parts of China.

In the meantime, especially since normalization of Sino-U.S. relations, investigation has been done on plants introduced and cooperative analysis has been made of both past and present ecological factors in the two main planting districts in China (north and south) and of their equivalents in North America—the Great Lakes region and southern Appalachians—which are similar to the trees' natural habitats.

The performance of the eastern white pine in its seedling stage was at first rather discouraging to observers at the Beijing Botanical Garden. In a 1978 test-planting under forest conditions, many seedlings died or did not grow well. The scientists finally realized that, in addition to the dry, cold winters and springs, alkaline soil in the Beijing area affected the trees' growth. They found ways to overcome this using fertilizer with higher acidity and through better winter care.

Now these fast-growing conifers can be seen in more areas of the country. Requests from individual woodlot planters as well as commune brigades show that they will soon be helping fill China's need for wood.

Ginseng, Saffflowers

Other valuable economic plants which have been tested at the Garden include American ginseng (*Panax quinquefolius*). Ginseng has been used as a tonic in China since time immemorial, but the species native to North America is preferred. Shipments of ginseng have been coming to China from North

America directly or indirectly since before the American Revolution. According to traditional medicine, the Chinese variety is "hot" and is therefore suitable only for the elderly, while the American variety can be given to both young and old. Seedlings were imported from Canada in 1975 with the intent of growing in China more of the kind grown in the U.S.

One tree the Botanical Garden is now introducing widely is the staghorn sumac (*Rhus typhina*), a native of eastern North America. With a cone-shaped flower head and its splendidly decorative flaming red leaves in late autumn, it has been given the name torch tree in Chinese. But it also has another side. It is strongly resistant to drought and severe cold and reproduces easily, so is now helping fix sand dunes in twenty provinces.

The safflower (*Carthamus tinctorius*) is another. This Old World thistlelike plant with orange flowers has long been known in China as an herb used in traditional medicine. Now a strain from Mexico, called in China AC-1 or Mexican red saffron thistle, has been imported with an eye to production of safflower oil. Its seeds are forty percent oil. A total of 1,000 acres have been planted to it in China's northwest.

Returnees

There are also some returnees. One is the late-spring flowering beauty bush (*Kolkwitzia amabilis*). Originally a Chinese plant, it was taken to Europe in 1901 by an Englishman, and from there went to Harvard University where several new varieties were bred which have since spread all over the West. Now they have reached China, and the improved blossoms attract attention wherever they are seen.

Another flower which has had a beauty treatment in North America is the daylily. It was mentioned 2,500 years ago in China's earliest poetry collection, *The Book of Songs*. Taken to Europe in the Middle Ages, it later found its way to the Americas. There, in the 1950s, scientists succeeded in creating through crossbreeding tetraploid daylilies (with twice the number of chromosomes) which are larger, stronger, come in more colors—and are still good to eat. In China the dried buds, known as "golden needles," are used to give a special flavor to

cooked dishes and soups. These, and even tetraploid ones created and sent by a friend, the late Prof. Laurence Arguimbau of the Massachusetts Institute of Technology, are growing well in the Botanical Garden, so we can eventually hope to see more of them in the parks.

Most celebrated of the returnees surely must be the Peace rose. A little-known fact is that its striking pale yellow blossoms, which turn to pink, were hybridized from several roses, one of which, '*Rosa foetida*', is Asian. The Peace rose is very popular for parks and gardens, and pots of it are sold widely in the free markets.

Aid Ecological Reconstruction

China has the richest plant resources in the world, around 7,500 endemic species of trees and shrubs alone. Yet introduction of plants from abroad is expected to be of great importance in her ecological reconstruction. Why?

Prof. Chen explained: "China is a vast land, shaped like a rooster with one leg on

the tropic of Cancer and its comb near the frigid zone. This means a 40° centigrade difference in temperatures between north and south. Plants that grow in the south generally cannot replace those in the north. But as China bears much resemblance to North America in latitudes and altitudes, many plants from there are adaptable here."

China wants to repair the heavy losses to her forests, and needs fast-growing trees. He cited the redwood, the bald cypress (*Taxodium distichum*), the pond cypress (*T.d. var. nutans*), the loblolly pine (*P. taeda*), the eastern white pine, and the slash pine (*P. elliottii*), among others.

He said that China still has a lot to do in systematics and taxonomy (classification and naming), areas in which many Western countries are far ahead. So it is essential that Chinese botanists cooperate with their counterparts overseas. "Of course, the benefit is on both sides," he pointed out. "We have been exporting many more kinds than we have imported. Plants know no boundaries. They are true cosmopolitans, the riches of all mankind." *

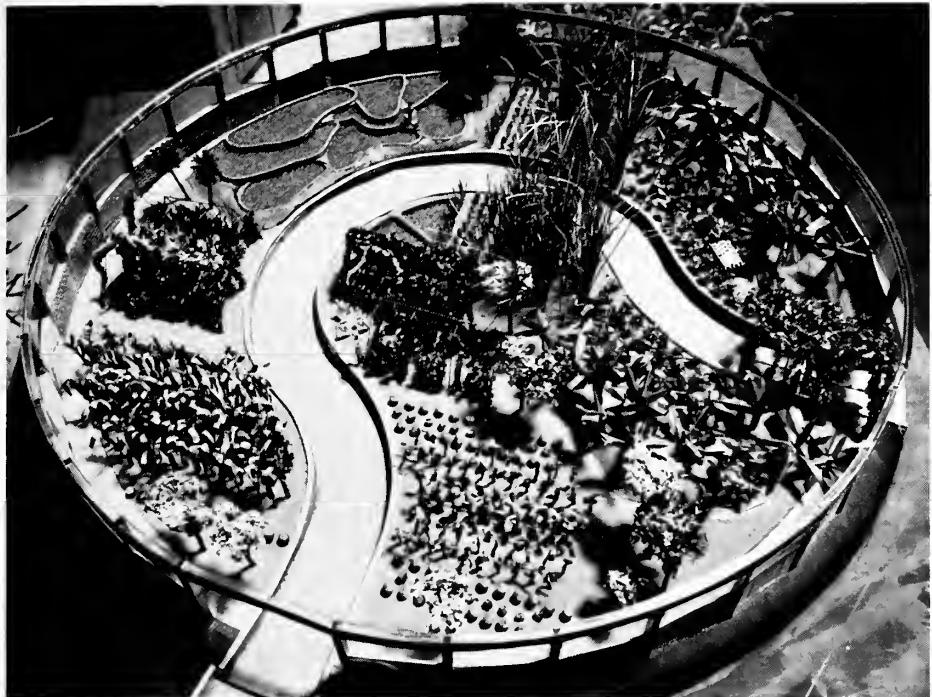
Morning Glories

*the night before blooming,
are tight-ridged white spirals
like candle-flamed light-bulbs;
at rise of sun,
with a fanfare of trumpet-mouths, they echo
the sky's deepest, least penetrable blue.*

*They survive, at most, the day, gradually folding
in on themselves, a few imprisoning
a bee and its diminuendo thunder
before dropping in tight, neat packets to the ground.*

*Next morning: a whole fresh multitude
populates the vine, folds up, falls.
Always alike, always new—each single
blossom a separate expression of the vine.*

Evelyn Ames



Schematic of projected garden

The outlandish world of Merle Jensen . . .

BRAVE NEW GARDEN

John Neary

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Merle Jensen pondered the puzzle ring on his finger. Taking it off and turning the circlet of cleverly entwined silver wires over and over, he absently disassembled it into its several component rings and piled them in a tiny heap on the luncheon table. Jensen is chief horticultural schemer-in-residence at a University of Arizona think tank in Tucson called the Environmental Research Laboratory (ERL). He loves puzzles and, even more, loves solving them with dazzling technological panache, solutions that mix plants, conveyor belts, spinning drums, and sheets of plastic foam. His penchant for

blending Buck Rogers and Rube Goldberg led to his designing the exhibits for "The Land," a six-acre agriculture pavilion at Walt Disney's EPCOT (Experimental Prototype Community of Tomorrow) in Orlando, Florida. Tinkering around in the greenhouse at ERL, Jensen came up with a showcase of futuristic tropical, Central American, and desert farming such as has never been seen before, all of it wacky and yet potentially profitable.

Most of Jensen's schemes contain a built-in payoff, as they must if they are to survive in the cost-conscious atmosphere of the

ERL. "If it doesn't mean dollars down the line," says Jensen with a shrug, "it's not going to come about. I stay away from hobby research, research just for my own benefit—the kind that goes on, say, at a university." Jensen is at a university. But ERL is kept afloat solely by its own earnings and the grants it obtains.

Merle Jensen, who once harvested six hundred pounds of vegetables from planters in his tiny office, does have a way of getting things to grow in a hurry, in the oddest places, at the oddest angles; tilting them, spinning them, rattling them along assembly lines, floating them aboard rafts, shaking up traditional methods of agriculture for the merry hell of it, to see what will happen—and, most often, to shake *us* up, too, to make us realize how important the artful science of growing plants is for our survival. Says ERL director Carl Hodges, "Merle's one of the more imaginative and certainly one of the most enthusiastic guys on the staff. I always try to design a project for him where he gets into a greenhouse for a while—Merle's got an incredible ability to grow plants. He could probably grow plants in concrete."

Feeding the Planet

The notion that there might not be enough victuals to go around alarms Jensen. In fact, it drives him to spread the alarm and to search for remedies. "Today we have four billion people," Jensen says, rattling off the statistics with easy familiarity because he gives this doomsday speech almost every day, to listeners ranging from casual visitors to corporate audiences who pay him \$1,000. "In the year two thousand, we'll have six billion people. We have a geometrical curve that just goes up like *this*," he says with a swoop of his hand like a jet fighter taking off. "The problem is, the increase in agriculture has only been arithmetical. In twenty years you're going to have fifty percent more people in the population."

EPCOT provided Jensen with an ideal arena in which to grab the attention of both the most uninterested tourist and the professional agronomist. For several years before the big show opened in Orlando last October, Jensen tested his exhibits, examining them over and over for performance and for problems, working in miniature in his sev-

eral thousand square feet of greenhouse space at ERL. Jensen displays this Tucson fiefdom with all the enthusiasm of a Sunday gardener, which he also happens to be.

He briskly walks visitors through a greenhouse the size of an airplane hangar crowded with waxy green euphorbias, plants whose milky sap is being investigated as a fuel. In a nearby greenhouse, workers are harvesting lettuce from floating plastic-foam flats that look like overladen freighters. A misting system overhead can drop the temperature in the greenhouse down to a comfortable 80°F even when the temperature outdoors is 115°. The system uses one-tenth the water ordinarily consumed in irrigation, says Jensen, and produces ten times the yield—200 tons per acre versus 20 tons per acre—in one-third the growing time.

A foot-thick layer of desert sand carpets the floors of all of his greenhouses. That skimpy foundation is enough to support Jensen's vegetable jungle, which in places is so high that workers must wear stilts in order to harvest. The plants are sustained by carefully concocted nutrient broths piped to them through a drip-irrigation system.

In his tropical greenhouse, Jensen has arranged a beguiling assortment of exotic plants, to demonstrate just what can be done when a horticulturist really concentrates on a limited amount of space. Banana plants tower toward the ceiling, and beyond the bananas are clumps of amaranth. Sugar cane is intercropped with pigeon peas and mung beans so that the latter two legumes can help supply nitrogen, thus saving money on fertilizer. The greenhouse also houses cocoyams and a stand of rice, loofahs growing on A-frame trellises, soybeans, and eggplants. Pole beans twine around cornstalks.

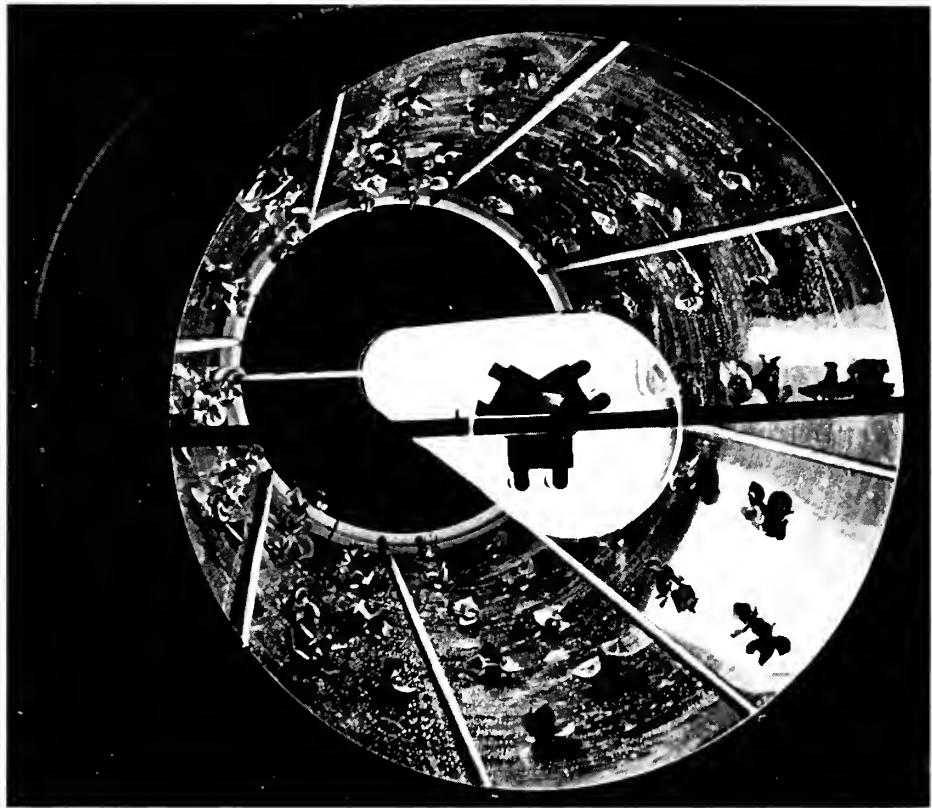
"When crowding begins to occur," Jensen explains, "one crop is harvested to allow room for those that remain."

Jensen has selected these plants because each is, in some way, a vegetable "superstar." Cocoyam, for example, thrives in either dry or marshy soils, and can be baked, boiled, fried, or ground into flour. Pigeon peas, which are one of the oldest food crops, contain more than twenty percent protein and are high in vitamins A and B and niacin. The dry stalks can be used for fuel and are so combustible they will start a fire when rubbed together.



Merle Jensen specializes in innovative, productive, attractive cultivation.





Simulated space culture in a revolving drum with axial fluorescent light source.

Simulating Space Culture

Jensen's showmanship is at its best in an adjacent greenhouse. Here the plants flourish amid the hum and buzz and gurgle of his unique electro-agriculture. The simplicity of the gadgetry and the materials in these rough mock-ups reveals the resourcefulness of Jensen's imagination.

Behold, for example, lettuce plants growing as Jensen imagines they might in outer space, not on a level plot of soil or even in floating flats, but suspended by centripetal force inside a revolving drum. The revolutions of the drum, Jensen explains, provide an inertial force that simulates the gravity that plants require to encourage the growth of roots and shoots. Fluorescent bulbs extending down the longitudinal axis of the drum provide light for photosynthesis.

Since Jensen estimates it would cost

\$1,000 per pound to ship food to workers in space, it is economical to grow food on board spacecraft. Jensen has already had phone inquiries about his revolutionary lettuce garden from aerospace companies. "Where have you been?" he chided one caller. "I've been waiting for your call for more than a year."

Midway down the greenhouse hangs a mobile assemblage of clustered pots: Jensen's herb garden. Pots contain borage, chives, parsley, sage, mint, and catnip watered by drip irrigation. An inconspicuous tube that feeds water to the topmost pot feeds them all in a trickle-down system.

Alongside the herb garden are plastic-foam A-frames, big sheets of foam board arranged like pup tents. On the slanted boards grow lettuce, spinach, and strawberries, their roots fed at intervals by a nutrient-laden mist. With this vertical system, twice

as many plants can grow on a square foot of greenhouse floor space as with conventional flats.

Jensen's shuffling of the conventional elements of agriculture is nowhere more vividly evident than in his use of a secondhand dry-cleaner's monorail trolley rack, once used to shuttle clean garments to the front counter. Upon it Jensen has suspended, in fiberglass tubs, tomato plants that move around the 100-foot circuit, passing through a nutrient spray that bathes their roots. The spray in turn is cleansed by passage through a tankful of water hyacinths that serve to scrub out the impurities, and which themselves may prove to be of secondary value. "Nature's Styrofoam," Jensen calls the thick pulp inside a hyacinth pod, slitting it open with a thumbnail to demonstrate. "It could be compressed to make a wallboard for houses. It won't burn."

Nearby is Jensen's most Rube Goldbergish combination to date, an invention so far beyond conventional agriculture that it required him to fill his home bathtub and toss a melon in, to see if it would float, before he proceeded. The idea was to grow lettuce on floating plastic-foam flats, shaded by cantaloupe vines; beneath it all, feeding on the lettuce roots, would be some hundred and fifty highly edible catfish. After the lettuce was harvested, Jensen schemed, the melons would in turn ripen and fall into the water and float toward the harvesting station. "Do they float? The first thing I did was stop and fill my tub and throw a melon in—and it floated!" Jensen enjoys showing off his breeding tubs full of golden *Tilapia*, freshwater food fishes from Africa, scooping them out to display them, huge and fat like carp. "I'm very interested in polyculture," he says, "where one organism benefits the other, where I can use the water as a conveyor for the plants, but where it is also a matrix for the fish, and the fish provide fertilizer for the plants. We'll be looking at eels. Maybe not here, but in another country. The challenge is, 'How can we grow more food with less water?' Traditional agriculture in the desert just doesn't make it." Halophytes—salt-tolerant plants—may well provide one solution for dry areas. These occupy center stage in the EPCOT display.

"It is change," says Jensen, "that man

has the most trouble with. Our laboratory capitalizes on change, and, looking at energy, at water, we try to look into the future to see what is there that is practical. If it doesn't mean dollars down the line, if it isn't something that somebody can put into effect, then it is not going to come about. If it involves too much change, then it's impractical."

A Life-long Interest

The forty-four-year-old Jensen has been working with plants and animals ever since he was a boy in Lynden, Washington, helping his Dutch grandfather with his cattle and his dahlias. The chores left him with a trace of a Dutch accent and a distaste for some of the drudgery. "My interest was in horticulture," he says with a laugh, "but my work was in dairy cattle. Then I took a course in horticulture, and boy did that smell better!" Over the years, Jensen says, he has learned that good horticulture is eighty percent art, twenty percent science. "We try to take the knack out of it and make it so that everybody can do it."

Jensen's instincts for connecting his knowledge of plants with some new application are never idle. He likes nothing more than to go home after work and work some more in his garden. From his 80' x 110' lot Jensen harvests grapes (he makes his own wines and puts some up as raisins), some five bushels of apricots, peaches and plums, as well as grapefruits, almonds, pomegranates, salad vegetables and a special chili pepper called 'Big Jim'. Even when he is ostensibly out of the garden, he is never far from horticultural plots. Jensen is a bit wistful recalling the days when he could spend more time in the greenhouse. "My life has become more and more shattered with ideas. We have made the university the third largest in the United States in receiving grants from industry. If we don't bring in any grants, we don't have a job—because there's no tenure."

But while he no longer gets his boots as muddy, there is the electricity of ERL. "Every time that phone rings," he chortles, "it could be from any part of the world. I get calls from Boeing, from Battelle, from England. This is not a hubcap job at GM; it's exciting. I don't know what I'm going to do tomorrow." *

ROTATE VEGETABLE CROPS FOR HIGHER YIELD

Nancy Bubel

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Don't throw away that diagram you made of this year's garden. If your garden map is anything like mine, it will have plenty of lines crossed out and additions scribbled in, and while it may not be the neat and tidy plan you began with last spring, you can still use this tattered document as a tool to improve your garden next year. To rotate crops you'll need to know where they were last planted, so come late winter you'll be glad you tucked away this well-worn diagram.

We gardeners often go to considerable trouble to improve our vegetable plots. We make compost, collect manure, and buy substances to discourage insects and treat diseases. There's one more thing we can do to boost soil and protect plants from disease: rotate crops. Crop rotation takes little extra time and costs nothing. The idea is to plan the garden so that no one kind of plant grows in the same place two years in a row. By rotating crops you can prevent or control many common garden problems. If any of the following have reduced your garden's productivity, you might find that a well-planned rotation scheme will make a difference.

Insects

Growing cucumbers, snap beans, or other bug-plagued crops in the same place year after year just makes things easier for the insects. When you move the cukes across the garden, the bugs will most likely find them eventually, but there won't be as many troublesome larvae lying in wait. According to the United States Department of Agriculture, corn moved to a different spot each year is less likely to be infested by the corn root aphid, seed corn maggot, northern corn rootworm, or southern cornstalk borer.

Beetle grubs thrive on any number of vegetables, but not in soil planted to white, red or sweet clover, soybeans or buckwheat.

Green manure crops like those, when used in a vegetable rotation plan, control pests as they enrich the soil.

Diseases

Some disease-causing fungi depend on the presence of the host plant to survive from one year to another. If you break the continuity by planting a vegetable that isn't susceptible to the fungus, the fungus will decline and possibly even die out. Fungal diseases that can be controlled by a three- or four-year rotation include bacterial bean blight; anthracnose of beans; blackleg of cabbage; verticillium wilt of strawberries; fusarium wilt of watermelon; and fusarium root rot of onions, peas and beans. Rotation is not a panacea, though. Some stubborn organisms like those that cause damping-off, potato scab and vascular wilts can live in the soil for years without any susceptible plants around. Nevertheless, rotation can contribute to a healthier garden by starving out troublesome microorganisms.

Nutrient Deficiency

Each vegetable we grow removes a slightly different assortment of nutrients and trace minerals from the soil. If we plant the same crop in the same spot year after year, the soil may become starved for the substances most heavily absorbed by that crop. Leafy crops and corn require a lot of nitrogen. Root crops need abundant potassium. Peas and beans must have plenty of phosphorus to form seeds. Actually, the soil and its contents are so complex that any such checklist is an oversimplification. Still, this principle remains true: if you keep the vegetables skipping around the garden, no one area will suffer severe nutrient depletion.

Include legumes and green manure crops in your rotation and scheme to maintain

and sometimes even increase soil fertility. In *The Joy of Gardening*, Dick Raymond describes what he calls his Eternal Yield gardens. Except for lime, these plots have received no outside fertilizer for ten years. The only enrichment they've received are green manure crops regularly turned under. Raymond also rotates his crops. Both annual soil tests and vegetable yields show that this program maintains soil fertility.

Raymond plants half of his test plot to peas and beans, which are turned under after bearing, but while still green. That planting is followed by a second green manure crop of rye grass. In the other half of the garden, he plants assorted vegetables: corn, tomatoes, and cole, root and leaf crops. He sows annual rye on this part of the patch at the end of the season. The following year, Raymond plants vegetables where the peas and beans were, and legumes where the mixed vegetables grew.

There are other ways to plan a vegetable rotation. A simple scheme would start with legumes, followed by heavy feeders like corn, celery, spinach and cabbage for the second year, and in the third year a planting of root vegetables. You can sneak in a green manure crop like buckwheat or rye grass each year if you divide your garden into four parts, one for each of these three vegetable groups and one for the green manure plants.

For a more finely tuned rotation system that controls insects and diseases, you might divide your garden into seven parts and rotate legumes; leaf and cole crops; root vegetables; cucumbers, melons, and squash; onions and garlic; tomatoes, peppers, eggplants and potatoes; corn and other grains. It is always best to follow a soil-building crop with one that needs rich soil, rather than with roots or bulbs, which require less nitrogen.

Because plants that are closely related—like potatoes and peppers or cabbage and broccoli—often share common diseases and insect pests, the ideal rotation would involve planting nonrelated plants in a given area for years two, three and four of the rotation. It's good to put in a legume crop about every four years.

Pennsylvania gardener Vertis Bream, whose garden is arranged in long raised beds, keeps his rotation system straight by devoting each bed to a plant group—tomatoes, leafy greens, roots, green manure crops, and so on. Each year, all groups move one bed to the south.

It isn't always possible to dovetail each crop succession as neatly as you might wish. If it all gets too confusing, remember the basic principles: (1) always rotate a vegetable that has had a disease or an insect problem, and (2) plant each kind of vegetable in a different part of the garden each year. ☘

Heavy Metals in City Soil

(Condensed from an article by the authors that appeared in *Environmental Pollution*.)

Recent articles have questioned the safety of consuming crops harvested from city gardens because of the possible contamination by cadmium and lead. Brooklyn Botanic Garden has conducted a children's vegetable gardening program since 1914, so it was essential to learn if these heavy metals accumulated in crops and soil.

Craig R. Hibben and Silas S. Hager of the BBG Research Center conducted tests in 1978-79 at BBG and in the suburbs. Lettuce, spinach, Swiss chard, cabbage, beets, scallions, onions, radishes and carrots were planted. Plant and soil samples were analyzed for lead and cadmium content.

Results indicated the levels of these two metals in test crops in Brooklyn were similar to, or below, levels reported in other studies. Based on tolerance of these metals allowable in the human diet by the World Health Organization, there is no significant health hazard.

Gardeners can have soil tested if in doubt. The addition of organic matter and maintaining the soil pH near neutral (6.5-7.0) will reduce plant uptake of lead and cadmium. ☘

Chinese Fragrant Rice

Lou Xizhi

Reprinted with permission from *China Reconstructs*, September, 1983.

Of the many kinds of rice grown in China, *xiangdao* (fragrant rice) is one of the most unusual. Its seeds contain an aromatic chemical, and the plants have a strong, sweet scent. At harvest time, the fragrance drifts over the paddies and hovers over the sunning grounds and mills.

Even a handful of the rice, when mixed with other cereal and cooked, spreads its aroma far beyond the kitchen. Hence the saying, "When one family cooks *xiangdao*, the neighbors enjoy it too." The rice is nutritious and sweet-tasting when eaten alone. Ground up, it is used as the basis for sweetmeats and pastries.

When boiled together with sugar, lotus seeds and peanuts, and combined with fruit, it becomes the famous *babaofan* (eight-treasure rice pudding). A cup of *xiangdao* rice water refreshes the diner who has eaten too much greasy food on festive occasions, especially during the Spring Festival.

An ancient book notes that a kind of fragrant rice thrived 2,000 years ago around the Changsha area in Hunan province. In the 17th century it was grown in Jiangsu province's Taizhou on the northern bank of the Changjiang (Yangtze) River and in northern Zhejiang.

As a plant, it is highly resistant to disease. Its spikelets emerge evenly, ripening at the same time, and grains do not drop off easily. However, it does well only in certain soil conditions and warm climates with a growing period of 140 days—30 days longer than for ordinary species, and the yield is low (1.5 tons per hectare, 4.5 tons less than the latter). Its stalk is tall and easily falls or is knocked over. So it is not surprising that this rice has always been a rare commodity. In the old days, it was sent to the emperors as tribute.

Today *xiangdao* rice grows abundantly in parts of Hunan, Yunnan, Shaanxi, Anhui, Jiangsu, Fujian and Guangdong provinces. The output is still not high. Most is for the domestic market, though small quantities are exported to Hong Kong and some Southeast Asian countries.

In recent years Chinese scientists have researched the history of *xiangdao* rice cultivation and bred some new species. The agricultural school of the Liyan area, Hunan province, after four years of experiments from 1979 to 1982, created an improved variety which produces 4.5–6.75 tons per hectare. Researchers are also investigating the ecological, biological, genetic and chemical properties of the rice—so perhaps someday soon its fragrance may delight many more people around the world. *

Xiangdao, Chinese fragrant rice, has an aroma that floats over the rice paddies and perfumes kitchens.





Laura Grillo of BBGRC oversees tomato plants.

Vertical tube culture...

TRY TUBOPONICS FOR SMALL SPACES

Silas Hagar

Tuboponics is a unique method of growing vegetables and plants in vertical tubes. The value of this growing method is that a great many plants and vegetables can be grown in a small space without the use of soil. In fact, twenty or more plants can be grown in the space that one plant would require using conventional methods. This means that small, sunny locations, such as the rooftops of city buildings, can be used as a new kind of "farmland."

Tuboponics was developed in Israel by agriculturist Tuvia Spector of the Volcani Institute. Spector successfully raised tomatoes, eggplants, strawberries and other fruits and vegetables in a greenhouse environment.

A joint research project was undertaken by the Brooklyn Union Gas Company and the Brooklyn Botanic Garden, with the co-operation of Consumer Action Now, to adapt the technology to the flat rooftops of

New York City. After two years of experimentation on the roofs of Manhattan and Brooklyn, the process of growing vegetables in vertical tubes proved successful.

There are some interesting advantages to using tuboponics. Besides being the equivalent of a large garden in a small space without using soil, a tuboponics system produces vine-ripened produce that is of a higher quality and less expensive than that found at stores. The technology also eliminates many of the "chores" that usually accompany other types of gardening.

Because there is no stooping, no bending, no back-breaking work involved, tuboponics is especially attractive to older and handicapped people whose mobility is restricted. In this article, you will learn how to make this practical, simple, satisfying, money and energy saving system work for you.

Constructing the Framework

A sturdy framework is essential to the success of your tuboponics system. The secure frame provides strong protection for the tubes, preventing them from being blown over in strong winds. This part of the system's construction might require a little ingenuity. Here are some possibilities: wires between top of tubes and anchor points; any firm attachment to the top of the tubes; if there is no top anchor point, you can make an anchor by placing weights on the base support.

Filling the Tubes

You are now ready to construct the tubes and fill them with the medium required for plant growth.

The tubes are white polyvinyl chloride, PVC $\frac{1}{8}$ " wall thickness, 6" in diameter and 5' in height. They can be purchased at any good hardware store.

1. Place the tubes on a bench. Drill 1" holes at twenty equidistant positions on the tubes, vertically. That is 4 rows, each with 5 holes, 10" apart. Holes can be drilled with either a 1" spade bit or a wood cut-out bit. Holes should start at least 16" from the bottom of tubes to allow plants to grow and not touch the ground.

2. Place PVC caps on bottom of tubes. Drill six $\frac{1}{4}$ " holes in bottom of PVC caps. Place tubes on a stand, and a drainage receptacle, (i.e., bucket or can), under the tube. Seal with PVC cement. Allow to dry for approximately 24 hours.

The tubes are now ready to be filled with the soilless medium required for plant growth.

3. Add one to two inches of pebbles or crushed rock to the bottom of the tubes. The use of 9-month Osmocote (13-13-13) and Micromax (for minor nutrients) in the soilless medium is recommended. These slow-release fertilizers will last an entire growing season, thus saving labor time, and reducing to a large extent any nutritional imbalances.

Fill the tubes to within one inch of the top with a *thoroughly mixed*, wetted medium of Perlite: Peat: Vermiculite (2:1:1 ratio), or Perlite: Metromix (2:1 ratio), to which has been added 1½ teaspoons of 9-month Osmocote (13-13-13), and ¼ teaspoon of Mi-

cromax per quart of mixture. These are all commerical preparations and can be obtained at any good garden supply or horticultural store.

You are now ready to install the tubes within the framework that you've constructed in the first phase.

4. Place the tubes 3 feet apart in a straight row, in a North-South direction if possible, so as to capture the best sunlight.

5. Firmly anchor the tubes to the framework.

Planting

1. About four to five weeks before constructing the system itself, you'll need to sow in Horticubes the seeds of the plants you choose.

2. Partially fill a tray with Peter's Hydro-sol supplemented with calcium nitrate. Specific instructions for the use of Peter's Hydro-sol are on the package. Peter's Hydro-sol is available at any horticultural supply house, and calcium nitrate may be obtained at the same source or, possibly, at your pharmacy.

3. Place the Horticubes on the trays. Do not allow the Horticubes to dry out.

4. Place the 3-4-week-old plants in the holes in the tubes by punching a hole in the medium with a large screwdriver or finger and squeezing the Horticubes plus roots into place.

Watering is done as often as needed, usually once a day. But the watering regime will fluctuate depending on local weather conditions. It is important that the medium be kept moist, *not wet*, at all times.

What Will Grow

Many vegetables, fruits and even flowers can be grown using the tuboponics method. Of course, due to the system's structure, it would be impractical to grow anything that forms a head, or any kind of root crop.

For spring and fall crops, you might wish to grow peas, spinach, strawberries and leaf lettuce. For summer crops, you might choose to grow tomatoes, beans, cucumbers, melons and squash. If possible, use bush-type plants. They do not produce vines which need tying and labor. Almost any kind of flower will grow beautifully as well. It really is up to your own taste as to what you decide to grow. The general rule is to grow what you will use. 

TREES CAPTURE AUTO POLLUTANTS

Reprinted from *Crops and Soils Magazine*, January 1983, pages 22-23, by permission of The American Society of Agronomy.

Trees are helping to capture part of the pollutants generated by automobile and truck traffic. This helps improve the quality of the air which drivers and residents breathe.

Most road users and those living near roadways are very much aware of the pollutants generated by the traffic. They can smell it; they often can see it; their eyes may burn; and things get dirty. On the other hand, these same individuals may not be aware of how important plants, especially trees, are in removing pollutants from the air.

Plants have been removing pollutants from the air long before the idea of an internal combustion engine was conceived, says Gerald Aubertin, associate professor of forestry at Southern Illinois University, Carbondale.

How They Do It

Plants capture airborne particles mainly through two processes—deposition and impingement.

In its simplest form, deposition consists of particles settling out of the air onto a surface. This can most readily be observed along any dry, untreated gravel or dirt road, although it is occurring along all traveled roads.

The dust clouds stirred up by the passage of a car or truck move with the wind and tend to settle onto the roadside vegetation. If one examines the dust captured and retained by the vegetation, two patterns may be seen. First, a quantity gradient exists. The amount of dust on the vegetation is greater near the roadway and decreases with distance from the road. Second, the side of the vegetation facing the road collects and retains more dust than the side of the vegetation facing away from the road.

Impingement is slightly more complicated. Particles move with the air; however, when the air is deflected to pass around an object, the heavier particles are not deflected and strike or impinge upon the object.

Broad, flat leaves, such as sycamore leaves, provide extensive surface area for deposition while small diameter objects such as small twigs, leaf stalks or petioles, or conifer needles are more effective in capturing particles by impingement. This is due to the air flow pattern around the different objects.

Leaf-surface characteristics affect a plant's ability to capture and retain particles. Sticky, hairy, rough or scaly surfaces are more effective collectors than are smooth surfaces.

The arrangement of the leaves or needles also has a bearing on the collection and retention efficiency, he says. Conifers, with numerous small diameter needles, provide many angles and pockets in which particles may be captured and held.

Plant and stand characteristics also influence pollutant capturing ability. The type, size, density and arrangement of the plants are all important. A solid, dense planting could act as a wall causing the air mass and airborne particles to rise and pass over the stand. This could disperse the airborne particles to a greater extent than were the stand not present. On the other hand, a moderately open stand allows the air mass to move within and through the stand. In this case the stand acts as a filter.

Other Benefits

Strategic plantings of appropriate roadside vegetation could have an important impact on improving the health, safety and welfare of both road users and those living near the roadway.

In addition, these plantings could provide numerous side benefits such as being aesthetically pleasing, reducing the noise level, serving as light barriers, protecting the roadside from damage, providing a shading and cooling effect, generating oxygen, providing food and shelter for wildlife and possibly providing valuable plant products. ♣

BONSAI COMPANION PLANTS

Margaret Rohde

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Flowering companion plants, successively blooming in small bonsai pots are more difficult for me to grow than the grasses and other green material. If one has enough of them, there is a good chance something will be blooming at all times, but it may not be the size or color desired at the moment. I grow them more as a separate entity, loving the chance to see each blossom as it appears, or the color and shape of a leaf. The challenge has been to see how much they will dwarf and still remain happy plants.

Dwarf Geraniums

Flaunting their brightly colored flowers, geraniums have been long-time favorites of mine, especially the smaller forms. My first experience with the latter came when I sent for a packet of seed from Park, something they called "Little Read Dwarfs". When these grew and flowered I found I had three pink-and-white and an all white. (I spent considerable time the first year trying to persuade myself that the three pink-and-white were all different; they weren't.) To these have been added many other varieties and finally, the further dwarfing through planting in small, even tiny, bonsai pots for companion use. I think that geraniums are looked down upon as companion plants. Possibly this is because they bloom continuously, having no real season. This negates the Japanese concept of using material which is in season. But what more cheerful sight is there on a gloomy winter's day than a little plant, bright red flower held high.

Of the six geraniums which I have in 1" to 3" pots, at least one or more is blooming, year round. I keep a continuous supply of extra cuttings on hand; should one falter, it can be quickly replaced. The leaves dwarf tremendously and even the flower is somewhat smaller. Some of the varieties which have worked well for me are:

'Black Vesuvius', very dark leaves and bright red flower; one has been in a 1" Murata pot for four years;

'Urchin', poinsettialike dark red flower, small cleft leaves; two years in a 1" round pot;

'Little Read', pink-and-white flower, zonal-marked leaf; in a 1" cube pot;

'Small Fortune', double white flower with pink blush, clear green leaf; in a 2" hexagonal pot;

'Salmon Comet', soft salmon-rose with leaf similar to the 'Black Vesuvius' above.

These can be used as companion plants or as handsized *mame*, as they do develop trunks and branches.

The soil mix is half home-compost (lean) and half sand, with a little peat if it seems too grainy. This is screened to 1/16th or for very small pots, to 1/30th. Doris Froning once said that she thought that the really small planting needed a somewhat finer mix (or there would only be three or four grains in a pot!). I usually have to water once a day for these little ones, and fertilize several times a year. A weak solution of 5-10-5 once in a while helps keep them blooming. Winters, they are placed under lights at a temperature of 65°F maximum; summers, usually in the greenhouse, in a tray of moist sand. They are not fussy about extremes of temperatures, but aren't happy if allowed to dry out. Best of all, they are almost completely insect-free; an occasional whitefly will usually go elsewhere.

When making cuttings for these little ones, I look for a very small, and small-leaved, branch on the stock plant. If a new cutting grows vigorously with large leaves, I pinch to make it branch but plan not to use it for a small pot. After a year or so, it may develop some more suitably dwarfed branch which then can become the mini plant. Keeping it in a small (2 1/4") pot helps.

Erodiums

With attractive leaves and an eye-catching blossom, erodiums look like small geraniums although the flower on the singles is quite different. *Erodium chamaedryoides* is the correct name for the one I have, and it is a plant with a mind of its own. What starts as a small compact mound will quickly send out short runners terminating in new plants. Sounds good, except that the bloom is usually on these, not on the main plant. One can keep runners cut off, with the result that the main plant becomes leggy and humps up. Frustrated again! But wait—with time and patience, the plant will slow down, become more compact and woody-looking, with much dwarfing of the unusual leaves; and, when it blooms, the half-inch blossom is lovely!

Of the three different ones which I have, the two with single flowers (a white with pink stripes and a pink with darker pink ones) are fairly loose plants, with a tendency to runners. Put into a small pot (2") and allowed to get pot-bound, they will grow slowly but also are very reluctant to bloom. The double pink is a little darling. Very compact now after three years in the same pot, it grows slowly and blooms frequently, often showing several of its half-inch lavender-pink flowers at the same time. It is in a deeper pot, 2½" × 2½", and makes me think that maybe these erodiums need the deeper pot to perform well.

I treat these as I do the dwarf geraniums; other than being a target for whiteflies, they seem insect-resistant.

Bellis and Bellium

As I became more and more interested in all these little things, I kept remembering the small daisies scattered in the grass at the park where I played as a child. Marguerites, they were called, and I made delicate, braided daisy chains with them. In trying to acquire the same plant without a trip to France to dig it from someone's lawn, I bought seed from various sources: two Bellis and two Bellium. As far as I can tell the difference between these is mostly size, and possibly, that the latter are not perennial.

Bellis perennis and *Bellis rotundifolia* var. *caeruleascens* are the larger ones; the former being the European lawn weed I re-



Evelyn Clawson

Miniature geranium *Pelargonium 'Janet Kerrigan'* shown approximately life size.

membered with such fondness. It makes a very pleasing plant for me, in a 2" × 2" pot; plant height 2", flowering often, two or three at a time, a scant 5/8" daisy, white with a pink tinge, on a 3" stem. The *caeruleascens* is a much larger plant with 1" or larger flowers on 5" to 6" stems. However, it may dwarf.

Bellium bellidioides and *Bellium minutum* seem one and the same to me, a very small plant with 1/2" leaves and 3/8" blossom on 1½" stems. Again, it is a daisy but unexpectedly dark red on the backs of the petals. Enchanting! [Ed. note: Actually *B. bellidioides* and *B. minutum* are two separate species.]

All of the above plants were grown from seed a year ago and bloomed in the late summer. The Bellis have continued to do so sporadically under lights, indoors; the Bellium have sulked. The question of whether these latter ones are perennial or not may be the problem, although one plant has been busy spreading by underground stolons. If I can get them all squared away, I think they will be enjoyable additions to my collection. *



Getting Wild Strawberries Home

Gathering wild strawberries always has been a summer's delight for children, whether in North America or in Norway, where six-year-old Nora DeStefano went this past summer to visit her maternal grandparents. European wild strawberries (*Fragaria vesca*) or *Jordbaer* (groundberries in Norwegian) are found in grasslands near the edge of woods. Historically, when hay was harvested in early summer, the plants, in fruit, were left exposed in the stubble, hence the English name strawberry. Small, succulent and intensely sweet, those berries that aren't popped into little mouths are easily crushed. One ancient solution is to string them on a long, stiff straw or grass seed stalk, as Nora has done. ❁

LIGHT UP AN INDOOR GARDEN FOR YEAR-ROUND ENJOYMENT

Sandra Ladendorf

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Orchids in your attic? Begonias or bromeliads in your basement? An herb garden in the kitchen? All this and more is possible if you join the legions of enthusiastic indoor-light gardeners.

I've been sold on indoor-light gardening since 1960, when I produced my first healthy tomato plants from seed—compact, flowering and ready to set fruit when I planted them outdoors. Gardeners had long been wanting to bring sunlight indoors, but it wasn't until 1938, when the first fluorescent tubes were introduced, that indoor-light gardening really began.

Growers experimented, bits of information filtered into the horticultural literature, and gradually amateur gardeners began using fluorescent lights. Some started a few seeds under one fixture; others developed sophisticated plant rooms where hundreds of plants thrived in conditions controlled by humidifiers, fans, hygrometers, timers, and automatic-watering systems.

How to Begin

It doesn't take fancy equipment or a huge investment of time and money to enjoy the results of indoor-light gardening. You can begin with one or two 4-foot fixtures, the kind you use in a basement shop and can buy inexpensively from your local store, where you can also buy fluorescent tubes.

The least expensive and most readily available tube is Cool White, satisfactory alone or in combination with Daylight or with the more expensive Gro-Lux Wide Spectrum. Add an inexpensive timer, and you're ready.

Next, decide where to garden. You don't have to go to Dorothy Kaye's extreme. Recently she removed all the fixtures from a bathroom in her Denver condominium and converted that space into an orchid room. The logical spot for a light garden in your

house may be in the basement, family room, kitchen, or garage. Currently mine is in the laundry room, where my plants love the humidity.

Location established, hang the fixture 12 to 15 inches above your growing area and set the timer to the desired length of daylight.

Short or Long Days

There are two approaches to this kind of gardening. You can do everything possible to create the perfect environment for one specific type of plant. For example, the cactus specialist might provide a 50°F temperature and a short 8-hour "winter" day. Or you can develop conditions in which a large number of different plants will be reasonably happy by selecting a 14- to 16-hour day and aiming for a 75°F "day" temperature with a ten degree drop at "night."

I can't supply absolute rules about where to place a plant in your light garden. Even in a small setup you will find microclimates. An experienced light gardener, such as George Elbert, author of *The Indoor Light Gardening Book*, says he continually experiments.

Let your plants be your guide. Look at them as you water. If an African violet is getting bunchy in the center, move it farther away from the lights, perhaps to the ends or sides of the fixture. If a geranium is getting too leggy, cut it back and put it closer to the lights. You will not burn any leaves unless it actually touches the tube.

Looking at your plants frequently also helps keep pests to a minimum. If you see an insect, first identify the bug and then take appropriate action.

Water and Soil

When you water, you can pour water into the top of the pot, stand the pot in water, or flood a tray, using wicks or capillary mats. Whichever method you prefer, pour plain

water through the pots every six to eight weeks to prevent the buildup of fertilizer salt.

How much you should water depends on many variables—pots (porous clay or water-retentive plastic), pot size, day length, humidity, temperature, amount of vegetation, variety of plant, and soil mix.

Choose any soil mix you like. Indoor gardeners are succeeding with many different recipes. However, if you want to add compost or topsoil from your yard, pasteurize it before use to eliminate any pests.

Many light gardeners like artificial mixes. Buy a commercial blend, or make your own with peat, perlite, and vermiculite.

Just as I don't like to feast one day and then fast for a week, so it makes sense to me to constantly feed my plants, using a very dilute solution for all waterings.

Remember that, in a light garden providing a 16-hour day year-round, you must feed regularly year-round. Disregard all house-plant books that recommend little or no food for indoor plants during the winter. That recommendation applies only to windowsill gardening during winter's short, gray days.

Humidity

The two problems most light gardeners have are lack of humidity during the winter and fungus problems during summer days.

How you solve the humidity problem depends on where in your home you are light gardening. If you are growing in an enclosed area, such as my laundry room or Mrs. Kaye's bathroom, it's easy to provide enough moisture. In a large open basement, however, try enclosing the light garden area. Sheets of polyethylene stapled from rafters to floor, for example, provide one quick and inexpensive solution. Within any confined area, you can then add a humidifier, if needed.

You can also increase humidity by using the pots-on-pebbles routine in any location in your house. By keeping the pebbles constantly wet, water evaporates around the plants and keeps the air around them more humid. Aim for 50 percent humidity. To check this level, use a hygrometer.

As you become a more sophisticated light gardener, you probably will want to acquire a hygrometer and a maximum-minimum

thermometer so that you know what your conditions are.

Fans and fungicides are the two best methods of combating summer molds, mildew, and damping off. Again, look at your plants—particularly pans of germinating seedlings—and quickly treat any problem with a fungicide.

Good air circulation also minimizes bacterial and fungal problems. The addition of a small fan will keep the air moving gently and promote healthy plants.

My plants all grow under 2-tube, 4-foot fixtures. While it is considered a low-light-intensity garden, this simple setup can raise a wide variety of plants. Now, in January, African violets, gloxinias, smithianthas and other gesneriads, miniature roses, miniature geraniums, begonias, and the seedlings of the new double impatiens are flowering in my light garden. I also am growing rhododendron, cyclamen, primrose and lewisia seedlings, ferns, and hoyas. And I've just started the geranium seeds for next summer's flowers.

During late winter, in fact, my light garden doubles in size because of seedling production. If you haven't tried raising your plants from seed under lights, now's the time. Your choice of plant material is much more interesting than the selection in any garden center. Also, it's more fun and it's even economical. As an example, last year a geranium in a 4-inch pot sold for \$2.50 here in my area of North Carolina. I could have raised 25 Carefree geraniums under lights for the necessary four months at a seed cost of \$3.75 and an electricity cost of \$18.16. What a bargain!

If you're interested in reading more on the subject of light gardening, there are several good books, including Elbert's. The Brooklyn Botanic Garden offers an excellent series of handbooks. One is "Gardening Under Lights," handbook #93, which costs \$2.25 plus 80¢ postage. Write to 1000 Washington Avenue, Brooklyn, N.Y. 11225.

As a final suggestion, join the Indoor Light Gardening Society of America. Membership provides contact with a large number of gardeners using light gardening in a myriad of ways. Annual membership is \$8. If interested, get in touch with Robert D. Morrison, membership secretary, 5305 S.W. Hamilton Street, Portland, Ore. 97221. *

We Get Letters . . . and How!

Brenda Weisman

Director of Information Services, BBG

In addition to several thousand telephone calls for horticultural information each year, BBG also receives about two thousand letters, most asking where to buy it, how to take care of it, what is it, and what's wrong with it. However, the variety of the requests remains infinite. For instance:

Dear Botanic Garden,

Please send me everything you have on flowers. I chose it for my project and have to give my report in two weeks so please send it in a hurry.

Your friend,

Dear Plant People,

My Schefflera is eight feet tall and is in an eighteen inch tub. The man at the store said to keep it on the dry side. It gets one quart of water every two weeks. Is this enough? Could it be why the leaves are turning yellow and dropping off?

Help!

To Whom It May Concern:

Please send me your most recent information on the cultivation of marijuana as soon as possible.

Yours truly,

(And attached to the specimen and wrapped with it—unmarked!)

Dear Sir,

Is this Poison Ivy? Thanking you for a prompt reply?

Yours truly,

May 30, 1983

Dear Plant Expert,

I need information on important facets of planning and preparing a vegetable garden including, the advantages of raised beds, tomato cages, trellises and plant caps, the location of perennial vegetables such as asparagus and rhubarb, the desirability of grouping crops according to size and maturity, and the procedures for sowing seeds and planting implants (*sic*). Please include also the reasons for planting several rows of corn together, a discussion of intercropping and companion cropping and the advantages of starting plants indoors.

In addition, what factors are important in the selection of type and variety of fruits for my garden and where does one learn about new fruit and vegetable varieties? For what reasons do fruit trees fail to bear and why is pruning important for woody fruit plants? Why is thinning of fruit sometimes practical and how may this be accomplished? What are the advantages of dwarf fruit trees in urban/suburban gardens and can they be successfully grown in containers? What are the inherent disadvantages of tree fruits in urban/suburban gardens and please outline a program for the maintenance of tree, vine and bush fruits?

Since the requested information is needed as soon as possible so I can work in my garden this year, I would like to ask for your prompt response to this letter.

Sincerely yours,

RECENT BOOKS WORTH NOTING

IN THE LIBRARY OF THE BROOKLYN BOTANIC GARDEN
(Please order directly from your bookstore, not from the Botanic Garden.)

Oriental Gardens

The Gardens of China by Edwin T. Morris. Charles Schribner's Sons, New York. \$37.50.

The Chinese garden is much less familiar to us than the Japanese. This is a thorough survey which is an excellent introduction. Morris teaches at Brooklyn Botanic Garden.

Japanese Influence in America by Clay Lancaster. Abbeville Press, New York. \$39.95.

Second edition of original published in 1963. Large-format book. History traced through Europe to influences in U.S.

Japanese Residences and Gardens by Michio Fujioka; photographs by Kanunori Tsunenari. Distributed by Kodansha International/USA, Ltd. \$18.95.

Coffee-table volume consisting largely of excellent color photographs. Stresses the integration of house and garden.

Kyoto Country Retreats by Michio Fujioka. Harper & Row, Publishers, Inc., New York. \$18.95.

Large-format coffee-table book with lavish use of color. The Shugakuin and Katsura palaces are the subjects.

Rock Gardening

Alpine and Rock Plants by Will Ingwersen. Distributed by Biblio Distribution Center, Totowa, New Jersey. \$22.95.

More about alpines. Not a listing of plants, but includes all the information for the gardener and armchair enthusiast.

Collector's Alpines by Royton E. Heath. Timber Press, Beaverton, Oregon. \$39.95. From a lover and collector of alpines, a definitive volume. The list is composed of 1850 entries—identification and cultural requirements.

Rock Plants for Small Gardens by Royton E. Heath. Distributed by The Hamlyn

Publishing Group Limited, New York. \$17.95.

How to grow and appreciate very small plants. New material has been added in this update.

Herbs

Culpeper's Color Herbal edited by David Potterton. Sterling Publishing Co., Inc., New York. \$12.95.

The essence of Culpeper's original work has been retained with uses updated to present practices.

The Field and Garden Guide To Herbs by M.M. Kondor and C.B. Wilson. Stackpole Books, Harrisburg, Pennsylvania. \$19.95.

Source for information on identifying, collecting, growing, drying and storing herbs, and how to use them.

The Honest Herbal by Verro E. Tyler. George F. Stickley Company, Philadelphia. \$14.50.

Latest scientific evidence on a large list of herbs (alfalfa to yucca) used in medicine. Well documented with references listed.

English Gardens and Gardeners

A Century of Gardens by Betty Massingham. Faber and Faber, Inc. Boston. \$24.95.

Biographies of some of Britain's garden-makers with looks at the gardens themselves.

The Cottage Garden and the Old-Fashioned Flowers by Roy Genders. Distributed by Merrimack Publisher's Circle, Salem, New Hampshire. \$17.95.

Classic favorites from the English cottage garden. Old shrub roses included. Interesting history from a well-known English authority.

Cottage Garden Year by Lys de Bray. Dis-

tributed by Biblio Distribution Center, Totowa, New Jersey. \$19.95.

Beautifully illustrated personal account of the artist's cottage garden. Month-by-month observations.

The Englishman's Garden edited by Alvilde Lees-Milne and Rosemary Verey. David R. Godine Publisher, Boston. \$27.50. A literary and photographic tour of a wide variety of English gardens each described by its owner-gardener in literate, highly individual style.

The Observer Book of Gardening by Frances Perry. Distributed by Merrimack Publisher's Circle, Salem, New Hampshire. \$17.95.

Good reference book arranged on a month-by-month basis. Color and black-and-white illustrations.

Three Gardens by Graham Stuart Thomas. Capability Books, Deer Park, Wisconsin. \$29.95.

Personal reflections about three gardens owned, designed and nurtured by the superb plantsman, Graham Stuart Thomas. Color illustrations plus black-and-white.

William Robinson by Mea Allan. Faber and Faber, Inc., Boston. \$19.95.

Biography of the man who changed gardening practices in England by devising and promoting the herbaceous border. For the interested garden historian.

Reissues of Classics

Shrub Roses of Today; Plants for Ground-Cover; Perennial Garden Plants by Graham Stuart Thomas. Distributed by Biblio Distribution Center, Totowa, New Jersey. \$22.50-22.95.

Reissue of classics with updated information on cultivars and species.

Wood and Garden; Lilies; Wall and Water Gardens; Roses by Gertrude Jekyll. The Ayer Company, Salem, New Hampshire. \$22.00-24.50.

Reissue of Jekyll classics. All the volumes are liberally illustrated with the author's photographs. Graham Stuart Thomas provides new forewords and glossaries with changes made in nomenclature since the books were first published. Some of his color photographs have also been added.

See also **Three Gardens** by Graham Stuart Thomas in the "English Gardens and Gardeners," above.

Landscape Design

Gardens Are for People by Thomas D. Church. McGraw-Hill Book Company, New York. \$37.50.

Update of a classic. This second edition contains new photographs with the original text somewhat reorganized. Church's influence on garden design is still pervasive. His belief that the garden is an "outdoor room" has manifested itself in the public mind as the "California style" of landscape architecture.

Natural Landscape by John Diekelmann and Robert Schuster. McGraw-Hill Book Company, New York.

Another gardening alternative—the naturalistic approach. Step-by-step directions; well illustrated.

Plant Groups

Bonsai by Christine Stewart. Distributed by Merrimack Publisher's Circle, Salem, New Hampshire. \$16.95.

History and principles plus step-by-step how-to projects. Nicely illustrated, large-format book.



A traditional Japanese border pattern of lilies, one of a near-infinite variety in *Japanese Border Designs*, Theodore Menten, Ed., Dover Publications, Inc., 1975.

Cacti and Succulents by Gunter Andersohn. Distributed by Sterling Publishing Co., Inc., New York. \$19.95.

Cacti and succulents from A to Z. Color illustrated, handsome book. Basic information on all phases of the subject.

The Care & Feeding of Trees by Richard C. Murphy and William E. Meyer. Crown Publishers Inc., New York. \$5.95.

Basic information on trees. An update of an older version. Useful reference.

The Color Dictionary of Camellias by Sterling Macoboy. Available only from The American Camellia Society, P.O. Box 1217, Fort Valley, Georgia 31030. \$35.00 (plus \$2.50 postage and handling).

This book celebrates the 150th anniversary of their introduction into Australia.

Ferns for the Home and Garden by Gillean Dunk. Distributed by Merrimack Publisher's Circle, Salem, New Hampshire. \$12.95.

Interesting reading for fern growers or interested fanciers. Candidates for garden and house with complete instructions for growing and care.

Gardening with Biblical Plants by Wilma James. Nelson-Hall Publishers, Chicago. \$24.95.

One hundred trees, shrubs, herbs, spices, flowers and food plants are discussed. Instructions for growing and the biblical significance of each is mentioned.

Growing Fruits and Berries by David Webb. Tab Books Inc., Blue Ridge Summit, Pennsylvania. \$12.95.

The ABC's of growing fruits and berries without using herbicides or sprays.

Jewels of the Plains by Claude A. Barr. University of Minnesota Press, Minneapolis. \$19.95.

Intimate knowledge of his native plants sparks readable prose in this highly informative volume.

The New Wildflowers and How to Grow Them by Edwin F. Steffek. Timber Press, Portland, Oregon. \$22.95.

Reissue of an older version which has been updated and enlarged. Author stresses conservation. Sponsored by the New England Wildflower Society.

Palms by Alec Blomberg and Tony Rodd. Distributed by Merrimack Publisher's Circle, Salem, New Hampshire. \$24.95. For those who can grow palms in the landscape or want to grow them as houseplants, here is a guide. Large format volume illustrated in color.

Gardening Techniques

The Beautiful Food Garden by Kate Rogers Gessert. Van Nostrand Reinhold Company Inc., New York. \$24.95.

Suggestions and ideas for combining vegetables, herbs and flowers in the garden landscape. Encyclopedia of attractive food plants.

The Contained Garden by Kenneth A. Beckett, David Carr and David Stevens. The Viking Press, New York. \$26.00.

How to choose a container, the plants for it, arranging them and caring for them—all you need to know about gardening outdoors in containers.

The Damp Garden by Beth Chatto. Distributed by Biblio Distribution Center, Tottowa, New Jersey. \$19.95.

Advice on gardening in damp locations by a gardener who has constructed a damp garden from scratch. Suggested plants in alphabetical order.

A Gardener's Guide to Propagating Food Plants by Franklin H. Fitz. Charles Scribner's Sons, New York. \$11.95.

Published earlier under the title "Compleatly Self-Sufficient Food-Plant Propagation." Basic how-to propagation methods.

The Gardener's Journal and Record Book by E. Annie Proulx. Rodale Press Inc, Emmaus, Pennsylvania. \$9.95.

Tips on soils, weather, references, garden design, with ample space for notes, diagrams and records.

Gardening for All Seasons by the Staff of The New Alchemy Institute. Brick House Publishing Company, Andover, Massachusetts. \$12.95.

Summarizes twelve years of experience raising food crops at the New Alchemy Institute on Cape Cod. Also—indoor and solar greenhouse gardening, fruit trees and food preservation.

Gardening for Maximum Nutrition by Jerry Minnich. Rodale Press, Emmaus, Pennsylvania. \$15.95.

How to plant and harvest for the highest nutrient content. Vitamin and mineral content of crops listed.

HP Books, Horticultural Publishing Co., Inc., Tucson.

Fruit, Berries & Nuts by Theodore James Jr. \$9.95.

Hedges, Screens & Espaliers by Susan Chamberlin \$9.95.

Pruning by Dr. Robert L. Stebbins & Michael MacCaskey \$9.95.

Joy of Gardening by Dick Raymond. Garden Way Publishing, Charlotte, Vermont. \$14.95.

Written as a companion to the television series of the same name, the book is generously illustrated in color. Down-to-earth information.

Lois Burpee's Gardener's Companion and Cookbook by Lois Burpee. Harper & Row, Publishers, New York. \$14.95.

Personal account of gardening from the wife of David Burpee. No-nonsense book—seeds through harvest, recipes.

The Low Maintenance Garden by Graham Rose. The Viking Press, New York. \$12.95.

Published in cooperation with the Institute of Urban Horticulture of New York Botanical Garden. Ideas for creating and maintaining a garden with minimum expenditure of time and effort.

Modern Home Gardening by Clyde L. Calvin and Donald M. Knutson. John Wiley & Sons, New York. \$24.95.

College-level textbook. Good resource for the gardener seeking the basic principles of gardening.

Month-by-Month Garden Almanac by Peter Loewer. The Putnam Publishing Group, New York. \$7.95.

Potpourri of information on house plants, outdoor gardening plus miscellaneous notes and hints. Line drawings.

Plant Propagation by John I. Wright. Distributed by Sterling Publishing Co., Inc., New York. \$16.95.

Practical information for the amateur on just about everything concerning propagation. Classified by botanical names.

Sunset Books by the editors of *Sunset Books* and *Sunset Magazine*. Lane Publishing Co., Menlo Park, California. New this year and done in their usual meticulous manner:

Pruning \$5.95. Applicable country-wide.

Gardener's Answer Book (companion to *Sunset New Western Garden Book*) \$7.95. Useful for the Western gardener.

The Weather-Wise Gardener by Calvin Simonds. Rodale Press Inc, Emmaus, Pennsylvania. \$16.95.

Written by a weather-lover who is also a gardener. Guide to understanding weather's influence on your garden.

In Memoriam

The Botanic Garden lost a friend of many years with the death of Dr. Cynthia Westcott in March.

Dr. Westcott, a plant pathologist, was known in her professional life as the Plant Doctor of Glen Ridge, New Jersey. As such she made wide-ranging "house" (garden) calls. She also wrote many books and guest-edited two BBG handbooks: *Biological Control of Plant Pests* (1960) and, with Dr. Jerry T. Walker, *Garden Pests* (1966).

Her other great interest led to a book *Anyone Can Grow Roses*. This was a subject she enjoyed teaching both at the Garden and the BBG Research Station after her retirement to Springvale-on-Hudson. Her spunky, no-nonsense approach inspired many would-be rosarians, who also learned how to keep their plants pest-free.

Window Boxes, Pots and Tubs by David Squire. David & Charles, North Pomfret, Vermont. \$22.50.

Alphabetical listing of plants suitable for containers, container types, care and feeding. Illustrated.

Little Critters in the Garden

Beekeeping—An Illustrated Handbook by Diane G. Stelley. Tab Books Inc., Blue Ridge Summit, Pennsylvania. \$10.95.

All the ins and outs of beekeeping. Includes harvesting and cooking with honey.

The Butterfly Gardener by Miriam Rothchild and Clive Farrell. Distributed by Merrimack Publisher's Circle, Salem, New Hampshire. \$14.95.

Information on attracting and keeping butterflies in the garden and greenhouse. Lovely illustrations.

Wildlife in Your Garden by Gene Logsdon. Rodale Press Inc, Emmaus, Pennsylvania. \$14.95.

If you want to learn how to live with wildlife in your garden rather than get rid of it, here is the how-to.

A Year in the Beeyard by Roger Morse. Charles Scribner's Sons, New York. \$14.95.

Month-by-month directions on keeping bees based on many years of experience.

Environmental Issues

A Global Crisis by Harold Koopowitz and Hilary Kaye. Stone Wall Press, Inc., Washington, D.C. \$16.95.

Who looks after plants and why does it matter? Can something be done about vanishing species? A good hard look at the subject.

The Granite Garden by Anne Whiston Spirn. Basic Books, Inc., New York. \$29.95.

Extremely well-researched treatise on the urban environment. Planners and city lovers will find new hope in their futures—with intelligent planning many urban problems can be corrected.

Landscape Planning for Energy Conservation edited by Gary O. Robinette and Charles McClellon. Van Nostrand Reinhold, New York. \$25.95.

Targeted for the professional landscape architect, the book covers site planning guidelines for solar utilization. Reference resource for concerned homeowners. Small print makes reading difficult.

Pest Control with Nature's Chemicals by Elroy L. Rice. University of Oklahoma Press, Norman. \$28.50.

Survey of ancient natural philosophers, natural scientists plus recent research. Overview of chemical ecology.

Serious and Commercial Gardening

The Insecticide, Herbicide, Fungicide Quick Guide by B.G. Page and W.T. Thomson. Thomson Publications, Fresno, California. \$13.50.

Information on which chemical to be used on which crop based on manufacturer's labels; USDA and FDA pesticide summaries.

The Lives of Plants by Doris M. Stone. Charles Scribner's Sons, New York. \$15.95.

Written for the nonspecialist in a clear, concise, readable manner, the book imparts some complex and advanced concepts. Includes easy but illustrative experiments. Ms. Stone is Director of Education at BBG.

Nursery Management by Harold Davidson and Roy Mecklenburg. Prentice-Hall, Inc., New Jersey. \$29.95.

Intended as a text for students, it is of interest to those in the nursery trade or those seeking related information. Good overview.

Orchid Biology—Reviews and Perspectives, I & II edited by Joseph Arditti. Cornell University Press, Ithaca. \$42.50 and \$45.00 respectively.

Based on papers by experts in their respective fields, these two volumes provide up-to-date information for scientists, commercial growers and serious hobbyists.

Plant Propagation by Hudson T. Hartmann and Dale E. Kester. Prentice-Hall, Inc., Englewood Cliffs, New Jersey. \$29.95.

Written as a college-level plant propagation text. Excellent information source for the experienced propagator seeking more information.

Essays of Note

Field Days: Journal of an Itinerant Biologist

by Roger B. Swain. Charles Schribner's Sons, New York. \$12.95.

Collection of essays covering multitude of topics from cranberries to head lice. Reading them is a pleasant excursion into the author's fertile mind.

Green Wisdom by Arthur W. Galston. The Putnam Publishing Group, New York. \$6.95.

A thought-provoking collection of Galston's essays which have appeared in "Natural History." Good book for the bedside.

Linnaeus: The Man and His Work edited by Tore Frangsmyr. University of California Press, Berkeley. \$25.00.

Collection of essays reveal complexities and contradictions in the life of Linnaeus—Prince of Botany.

Encyclopedias

Combined Rose List 1983 by Beverly R. Dobson. Available from the author, 215 Harriman Rd., Irvington, New York 10533. Paperback \$5.00.

A highly-regarded buyer's guide.

Garden Shrubs by Arthur Hellyer. Distributed by Biblio Distribution Center, Totowa, New Jersey. \$25.00.

Encyclopedia of shrubs preceded by general information on care, selection and uses. Nice line drawings.

The Gardener's Book of Trees by Alan Mitchell. Distributed by Biblio Distribution Center, Totowa, New Jersey. \$25.00. Introductory chapters cover history, general cultural information and guidelines for selection. The remainder is devoted to an alphabetical listing of garden trees.

Hillier's Manual of Trees and Shrubs; Fifth Edition. Van Nostrand Reinhold Company, New York. \$20.50.

Update of the familiar manual, the fifth edition contains color illustrations. Excellent reference book.

The Illustrated Book of Trees by William C. Grimm. Stackpole Books, Harrisburg, Pennsylvania. \$14.95.

Illustrated guide to tree identification. Keys to both summer and winter characteristics.

Landscape Plants for Eastern North America by Harrison L. Flint. John Wiley & Sons, New York. \$59.95.

Comprehensive guide to 1,500 landscape plants of the eastern U.S. excepting Florida and the Gulf Coast. Seasonal interest, problems and maintenance, size, habit and adaptability included with drawings and photographs. Intended for the professional and serious plantsman. Excellent reference.

New Plant Sources for Drugs and Foods by Siri Von Reis and Frank L. Lipp, Jr. Harvard University Press, Cambridge. \$25.00.

Reference work based on survey of New York Botanical Garden's herbarium collection.

Field Guides

Common Plants of the Mid-Atlantic Coast

by Gene M. Silberhorn. The Johns Hopkins University Press, Baltimore. \$7.95.

Useful field guide to plants of this area. Beautifully illustrated by Mary Warinner.

Edible Wild Plants by Thomas S. Elias and Peter A. Dykeman. Van Nostrand Reinhold Company, Inc., New York. \$22.95.

Handsome field guide lavishly illustrated with color photographs. Seasonal key helps make field identification simple. Harvesting and preparation included.

Field Guide to Orchids of North America

John G. Williams and Andrew E. Williams. Universe, New York. \$10.95.

Pocket-sized guide with color illustrations. Useful, but the type is small.

A Foraging Vacation by Raquel Boehmer. Down East Books, Camden, Maine. \$7.95.

Love affair with the Maine coast is translated into an attractive guide to collecting edibles. Includes shoreline plants, fish and shellfish with recipes for preparation.

Arts and Crafts

Flower Crafts by Emma Wood and Jane Merer. Merrimack Publisher's Circle, Salem, New Hampshire. \$14.95.

Preserving fresh flowers, drying them, making them of paper, needlecraft—step-by-step instructions in well-illustrated form.

Small and Beautiful Flower Arrangements

by Marion W. Johnson. Crown Publishers, Inc., New York. \$10.00.

Focuses on small arrangements, many using wayside plants—the basic how-to. Many color photographs.

Miscellaneous

The Flower Game by Fleur Cowles. William Morrow and Company, Inc., New York. \$15.95.

Nearly 200 friends of Fleur Cowles responded to her invitation to name their ten favorite flowers. Book is liberally sprinkled with her lovely drawings.

The Gardens at Giverny: A View of Monet's World by Stephen Shore. Aperture, Millerton, New York. \$22.50.

Photographic essay of the restored gardens that served as Monet's inspiration. Handsome book.

Gardening Is For Everyone by Audrey Cloet

and Chris Underhill. Souvenir Press, London. £4.95.

Basic information about teaching gardening to the mentally and physically handicapped.

The Glass Flowers At Harvard by Richard Evans Schultes & William A. Davis; photographs by Hillel Burger. E.P. Dutton, Inc., New York. \$15.95.

Excellent photographs of the world-famous "Ware Collection of Blaschka Glass Models of Plants," each rendered in precise and exquisite detail. Description of each.

The Lore of Flowers by Neil Ewart. Distributed by Sterling Publishing Co., Inc., New York. \$19.95.

Illustrated book describes folklore and historical associations of many familiar flowers.

There have been an extraordinary number of books on gardening from England in 1983. Most have been written by experts who are respected in their fields. However, if not conscientiously adapted to American gardens and climates, the use of the plants described is risky business unless you are an experienced plantsman familiar with the transatlantic differences.

**U.S. POSTAL SERVICE
STATEMENT OF OWNERSHIP,
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(Required by 39 U.S.C. 3685)**

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Publisher: Brooklyn Botanic Garden, 1000 Washington Ave., Brooklyn, New York 11225

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Managing Editor: Barbara Pesch, Brooklyn Botanic Garden, 1000 Washington Avenue, Brooklyn, New York 11225

7. Owner (if owned by a corporation, its name and address must be stated and also immediately thereunder the names and addresses of stockholders owning or holding 1 percent or more of total amount of stock. If not owned by a corporation, the names and addresses of the individual owners must be given. If owned by a partnership or other unincorporated firm, its name and address, as well as that of each individual must be given. If the publication is published by a nonprofit organization, its name and address must be stated.): Brooklyn Botanic Garden Corporation, a nonprofit organization incorporated under the laws of the state of New York, 1000 Washington Avenue, Brooklyn, New York 11225

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9. The purpose, function, and nonprofit status of this organization and the exempt status for Federal income tax purposes has not changed during preceding 12 months.

10. Extent and nature of circulation:

A. Total no. copies printed (Net press run)	17,500	20,000
B. Paid circulation		
1. Sales through dealers and carriers, street vendors and counters sales	329	1,025
2. Mail subscriptions	12,241	12,078
C. Total paid circulation (Sum of 10B1 and 10B2)	12,570	13,103
D. Free distribution by mail, carrier or other means (samples, complimentary, and other free copies)	332	690
E. Total distribution (Sum of C and D)	12,902	13,793
F. Copies not distributed		
1. Office use, left over, unaccounted, spoiled after printing	4,598	6,207
2. Return from new agents		
G. Total (Sum of E, F1 and 2—should equal net press run shown in A)	17,500	20,000

I certify that the statements made by me above are correct and complete.

BARBARA B. PESCH, *Editor*



Eva Melady

AN INVITATION TO JOIN AND ENJOY

**A man does not plant a tree for himself;
he plants it for posterity.**

—Alexander Smith

ALL who read these lines and are interested in the out-of-doors and the beauty of living things are cordially invited to become Members of the Brooklyn Botanic Garden. The dues are \$15 annually. Memberships make fine gifts, too. For many, the Botanic Garden means spiritual enrichment, and they find satisfaction in contributing toward its support. Others enjoy the Membership opportunities, which include a subscription to *PLANTS & GARDENS*, occasional plant and seed "dividends," popular short courses at reduced rates and other benefits. Why not get pleasure from both?

...cut off here

APPLICATION FORM FOR MEMBERSHIP

BROOKLYN BOTANIC GARDEN (A Membership Society)

1000 Washington Avenue, Brooklyn, N.Y. 11225

I would like to become a member of the Brooklyn Botanic Garden

Mr. Mrs./Miss/Ms

Address

City

State

ZIP

Membership Categories Please write to the Garden for details of special memberships

Individual Membership, \$15 Sustaining Membership, \$25

Supporting, \$100 Contributing, \$250 Patron, \$500 Benefactor, \$1000

Membership runs for 12 months from the date of enrollment

(Gifts to the Garden are deductible for income tax purposes)

THE WORLD'S MOST EXTENSIVE GARDENING BOOK SERIES

EACH PUBLICATION a complete, concise, well-illustrated manual of 64 to 104 pages, with ideas to put to work in any garden. (These Handbooks are separate editions of special-feature issues of *PLANTS & GARDENS*.) One of America's best horticultural values. Arranged by subject:

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- 71 HOME LAWN HANDBOOK
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- 95 PRUNING
- 24 PROPAGATION
- 77 NATURAL GARDENING HANDBOOK
- 89 GARDENING WITHOUT PESTS
- 34 BIOLOGICAL CONTROL OF PLANT PESTS
- 73 WEED CONTROL
- 100 LOW-MAINTENANCE GARDENING

SPECIALTY PLANTS AND GARDENS

- 85 CONTAINER GARDENING (*outdoors*)
- 61 GARDENING IN THE SHADE
- 38 GARDENING WITH WILD FLOWERS
- 91 ROCK GARDENING
- 84 SMALL GARDENS FOR SMALL SPACES
- 92 ROSES
- 36 TRAINED AND SCULPTURED PLANTS
- 86 GROUND COVERS AND VINES
- 74 ANNUALS
- 87 PERENNIALS AND THEIR USES
- 56 SUMMER FLOWERS FOR CONTINUING BLOOM
- 96 BULBS
- 59 FERNS

BONSAI, JAPANESE GARDENS

- 13 DWARFED POTTED TREES: THE BONSAI OF JAPAN
- 51 BONSAI: SPECIAL TECHNIQUES
- 81 BONSAI FOR INDOORS
- 37 JAPANESE GARDENS AND MINIATURE LANDSCAPES

TREES AND SHRUBS

- 22 BROAD-LEAVED EVERGREENS
- 47 DWARF CONIFERS
- 25 100 FINEST TREES AND SHRUBS

99 NURSERY SOURCE MANUAL

- 94 FLOWERING SHRUBS
- 41 FLOWERING TREES
- 67 FRUIT TREES AND SHRUBS
- 66 RHODODENDRONS AND THEIR RELATIVES
- 65 TREE AND SHRUB FORMS—THEIR LANDSCAPE USE

HERBS, VEGETABLES, ARTS, CRAFTS

- 98 HANDBOOK ON CULINARY HERBS
- 68 HERBS AND THEIR ORNAMENTAL USES
- 69 THE HOME VEGETABLE GARDEN
- 80 DESIGNING WITH FLOWERS
- 76 DRIED FLOWER DESIGNS
- 46 DYE PLANTS AND DYEING
- 72 NATURAL PLANT DYEING
- 58 MINIATURE GARDENS (*sink and trough gardens*)

INDOOR GARDENING

- 70 HOUSE PLANT PRIMER
- 90 HOUSE PLANTS
- 93 GARDENING UNDER LIGHTS
- 42 GREENHOUSE HANDBOOK FOR THE AMATEUR
- 53 AFRICAN-VIOLETS AND THEIR RELATIVES
- 81 BONSAI FOR INDOORS
- 54 ORCHIDS
- 43 SUCCULENTS

A BUNDLE OF OTHERS

- 75 BREEDING PLANTS FOR HOME AND GARDEN
- 49 CREATIVE IDEAS IN GARDEN DESIGN
- 45 GARDEN STRUCTURES
- 82 THE ENVIRONMENT AND THE HOME GARDENER
- 88 COMMUNITY GARDENING

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